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REPORT TO THE STATE BOARD OF AGRICULTURE,

ON THE MOST IMPORTANT RECENT IMPROVEMENTS OF AGRICULTURE IN LOWER VIRGINIA—AND THE MOST IMPORTANT DEFECTS YET REMAINING.

By Edmund Ruffin.

The time can yet be remembered by many persons now living, when the improvement of the general or average rate of product of land by its fertilization was scarcely attempted, or even thought of, in the lower and middle regions of Virginia. The efforts to increase the amount of the products and profits of agriculture, were not wanting then, more than now. But it was by adding to the cultivated surface by new clearings of wood-land, and by thus substituting fresh and richer ground for such as was worn-out and totally worthless. The manuring was almost limited to the partial saving and use of the excrement of the live-stock; no more vegetable matter, as litter, being used, or thought worth the labor of using, than would serve to absorb and retain the animal juices. Perhaps only the more ignorant cultivators believed that vegetable matter was not manure of itself; but of the more intelligent, but few would have deemed that the doubling the ordinary small amount of litter in their farm yards and stables, would not have been of more labor than profit, even for lands the best adapted to be benefited by such manures. With very few exceptions, there was no more litter used than necessary to prevent the cattle from suffering by the wetness and filth of their pens and beds; and to serve to soak up partially the fluid matter, of which otherwise the waste was manifest. The straw of the wheat and oat crops, and the stalks of the tobacco, were necessarily brought to the barns to be separated; and, with greater or less waste, these materials were in some manner necessarily converted to manure. But the much larger quantity of corn-stalks were left in the field, to be afterwards burnt out of the way of the next ensuing crop; and still less was any other supply of coarse litter sought or desired. Even this small extent of manure-making was a great improvement on the older practice. Thomas Adams, an observant and respectable old farmer of Prince George, who died about 20 years ago, told me that he remembered the first beginning, in that county, of keeping up the work horses at night, on litter, for the purpose of increasing the manure, instead of turning them out to graze in the pastures. The practice was introduced by a new overseer on Old Town farm, then one of the "quarters" of the head of the Carter family; and it attracted much more of notice for censure, than for applause or imitation. The comment of one of the neighbors was, that "whenever *he* should be obliged to make manure for his land, he should think it full time for him to move to the *back woods*,"—the name by which the more western settlements were then called.

With a few honorable exceptions, very few of the wealthy land holders, attended personally or regularly to the management of their farms, previous to the last 30 years. Still, some few excellent cultivators, and judicious managers of their farms, were profiting by pursuing a different course. Such were Philip Tabb of Gloucester, Fielding Lewis and John Minge of Charles City, and John Taylor of Caroline. The writings of the latter subsequently gave an impulse which may be considered as being the commencement of our improving state of agriculture, and with which the following recital will set out.

The 'Arator' of John Taylor, was published in a volume in 1813, and soon acquired a popularity, and a ready acceptance of its worst errors as well as its most valuable truths, which no other agricultural publication has obtained. The two most important improvements which the author thus made generally known, were both in regard to the using of vegetable matters as manure.

I. The making of farm-yard and stable manure, in which the vegetable materials are in very large proportion to the animal matter.

The first of these lessons, and great improvements on previous general opinion and practice, was the almost unheard of plan of using as litter all the vegetable offal of the crops, no matter how excessive the proportion might be to that of the animal excrement; or, in teaching a reliance on the fertilizing properties of vegetable matter as manure to soil, and food for plants, without regard to the amount of admixture of animal matter. And this, however universally understood now, so much, indeed, that the former state of general opinion can scarcely now be realized, was then totally new doctrine to nineteen in twenty of those who to it soon became converts. And the improved practice, thus brought about, was made the more extensive by another then novel lesson taught by Taylor, that the fermentation of manure before application was unnecessary and wasteful. Before that time, the little farm-yard manure which was made, was left exposed first on the yard, and next heaped, and in both states wasting, and the use lost, for a whole year before being used for the next crop of tobacco. The advantages and disadvantages of the different modes of preparing farm-yard and stable manure, of the different conditions when applied, will be again adverted to under a subsequent head, when the still newer practice of top-dressing on grass will be considered.

II. Manuring by "enclosing" or non-grazing, or excluding stock from fields when in grass, or not cultivated.

The next great improvement, and innovation on previous opinions and practice, was the plan of manuring fields by leaving on them, to die and decay, their own vegetable growth, whether of artificial grass, or, in its absence, of the weeds and other natural growth, whenever tillage crops

were not on the field. This, though it be Nature's own and universal mode of restoring fertility to impoverished lands, and therefore is offered to the observation of all persons, had not been practised before any where; nor had even the theoretical truth on which the practice rests, been received or considered. The plan may be claimed as an improvement entirely Virginian, in large and systematic use; and the first promulgation and extension of the practice was due to the mind and the labors of John Taylor, and especially to the publication of his 'Arator.' It is true, that this mode of fertilization is not suited to lands already in a productive state, nor where animal products are very profitable, or indispensable—nor where putrescent manures can be obtained by purchase, or from other foreign sources, more cheaply than to surrender the grazing of entire fields, however poor and bare of grass. But the system was, nevertheless, admirably suited to the general condition of eastern Virginia—nearly every farm of which presented much of exhausted, and miserably poor fields, producing, when grazed, very scanty sustenance to a half-starved stock of cattle, which, even if 100 in number on a particular farm, yielded very little return to the proprietor. One fourth of the number, if of well kept cattle, would have yielded more, in milk, meat, and labor, and nearly as much in manure. In fact, the gross product of the then large stocks of cattle on the farms of eastern Virginia, estimated at fair market prices, did not compensate their owners for the cost of keeping, them, without including the enomous attendant expense of the fences dividing the several fields of each farm, and which were rendered necessary solely that nearly starved cattle might roam over the almost naked pasture fields. To adopt some other mode of keeping a much smaller stock, was of itself a great saving; and by so doing, all the natural growth of the fields, when resting from tillage, served to manure the ground on which it grew—giving back, in the large proportion formed from the air and water, perhaps twice as much of enriching matter as they had drawn from the soil. And however scanty might be the cover of weeds to the acre, the whole amount on the field would be greater than the owner could possibly have supplied to his farm in prepared vegetable manure; and moreover, it was already spread over the whole surface, and applied in the best manner, as well as produced without labor or cost. If the several fields of a farmer (under the then usual circumstances) were 100 acres each, and three in number, (the rotation, corn, wheat or oats, and rest,) while he could barely manure 10 acres of his corn field from the farm-yard and stable, and by naked summer cow-pens also, he could add thereto the slight but costless manuring of the 100 acres to which the rotation gave rest that year. Suppose this cover to the 100 acres to be worth but half as much as the other manure, (in the earliest practice, and the then most impoverished condition of the land,) the 100 acres so treated would at least receive the value of 5 other acres manured; and this would be adding at once 50 per cent. to the previous amount of manuring done, and that without any increased expense, or loss of other products.

But, great as was the improvement undoubtedly made by these two modes of vegetable manuring, there was much waste of effort, and much loss subsequently suffered, by applying improperly in practice the doctrines and instructions of Taylor, which were true in theory, and of which the application would have been profitable under other circumstances. It was necessary to learn, (what is now much better and generally understood, but what Taylor neither taught nor seemed to know,) that naturally poor land cannot be durably or profitably enriched by vegetable or putrescent manures, so as to be raised and kept above its original state of fertility. And on such lands, therefore, after a certain slight degree of improvement obtained, even the cheap manuring methods of Taylor were almost thrown away. And on better original soils, after being much recruited and enriched by such means, there are enormous and yearly increasing evils produced, in the troublesome weeds encouraged to grow, and the myriads of insects sustained by their growth, and which become depredators on the succeeding cultivated crop. Even the ploughing under the rank weeds on moderately rich land became a difficult operation; and, like the also difficult ploughing under of coarse unrotted manure from the farm-yard, was often very troublesome to tillage, and sometimes even injurious to the first tilled crop. But these objections do not lessen the merit of Taylor's "enclosing system," for a vast extent of impoverished fields, for the restoration and improvement of which, that system was not only profitable, but indispensable. The greatly increased and extended benefits of these and other applications of vegetable manures, were, however yet to be shown by the subsequent introduction of the knowledge and use of calcareous manures.

III. Marling, or manuring from beds of fossil shells.

This mode of fertilization, now so general through all the marl region of lower Virginia, was not practised except on three on four detached farms, and that to but small extent, before 1820. Some few and generally small experimental applications of marl had indeed been made, by different individuals, from 15 to as far back as 45 years before; but which applications, from total misconception of the true mode of action of calcareous manures, had been deemed failures; and without exception, of course, had been abandoned by the experimenters, as worthless; and the experiments had been almost forgotten, until again brought to notice, after the much later and fully successful introduction of the practice.

Henley Taylor and Archer Hankins, two plain and illiterate farmers, and near neighbors in James City county, were the earliest *successful* and continuing appliers of marl in Virginia. But at what time they began, and which of them was the first, I have not been able to learn, though visiting Mr. Hankins' farm for that purpose, as well as to see his marling, and making inquiries of him, personally, in 1833. Mr. Taylor had then been long dead, and his improvements said to be almost lost, by the exhausting cultivation of the then occupant of his land. Mr. Hankins was unable to say when he and his neighbor began to try marl. He was only certain that it was

before 1816. Yet, though these farms are within 12 or 15 miles of Williamsburg, to which place I had made visits once a year or oftener, yet I never heard an intimation of their having begun such practice, until some time after my own first trials in 1818. At that time, when led to the use, as I was, altogether by theoretical views, and by reasoning on the supposed constitution of the soil, as well as the known constitution of the manure, it would have been to me the most acceptable and beneficial information to have heard that any other person in Virginia had already proved practically the value of marling. The slow progress of the knowledge of the mere fact of marl having been successfully used before that time, was a strong illustration of the then almost total want of communication among farmers, as well as of their general apathy and ignorance, in regard to the means of improving their lands.*

Much earlier than the commencement of marling in James City, the practice had been commenced, (in 1805) in Talbot county, Md., by Mr. Singleton. His account of his practice is in the 4th volume of the 'Memoirs of the Philadelphia Agricultural Society,' dated December 31, 1817, and first published some time in 1818. But successful as was his practice, and also that of Mr. Taylor and Mr. Hankins in connexion with much worse farming, it is certain that neither of these individuals had the least idea of the true action of marl; and they were indebted to their good fortune, more than to any exercise of reasoning, that they received profitable returns, and did no injury by marling. They all three applied their putrescent manures with the marl. But though this was the safest and most beneficial plan, the thus uniting them prevented the separate action and value of putrescent and calcareous manures being known, compared, and duly appreciated.†

My own application of marl, on Coggins Point farm, Prince George county, which in 1818 extended only to 15 acres, (of which but 3 or 4 were under the crop of that year,) by 1821 had been increased to above 80 acres a year, and so continued until nearly all the then arable land on that farm requiring it, (more than 600 acres,) had been covered. In 1821, my earliest publication on the subject was made. Though the facts and reasoning thus made known by that time were beginning to attract much notice, and to induce many persons to begin to marl, still it was some years later before incredulity and ridicule had generally given place to full confidence in the value of the improvement. Even at this time, when nearly 25 years of my own experience of marling and its benefits have passed, and the results are open to public notice and scrutiny, not half the persons who could marl are engaged at it, or are marling to but little purpose; and of all who are using marl, nineteen in twenty are proceeding injudiciously, without regard to the mode of operation of the manure, and therefore are either doing harm, or losing profit, almost as often, though in less degree, as doing good. At this time, however, there are scarcely any persons, however negligent in practice, who do not fully admit the great value and certain profit of applying marl whenever it is found.

But with all the existing neglect of using this means of fertilization, and with all the still worse ignorance of or inattention to its manner of operating, there never has been a new improvement in agriculture more rapidly extended, or with such beneficial and profitable results. In Prince George county, there is not one farmer having marl on or near his land, who has not applied it to greater or less extent, and always with more or less profit—and, in most cases, largely as well as profitably. In James City county there has been perhaps the next largest as well as the oldest practice. In York county, as in James City, some of the most valuable and profitable improvements by marling have been made. And some of the farms of both counties, adjoining Williamsburg, and having the benefit of putrescent town manures, show more strikingly than any others known, the remarkable power of calcareous manure to fix the putrescent in the soil, and make them more efficient and far more durable. In Surry, Isle of Wight, Nansemond, Charles City, New Kent, Hanover, King William, King and Queen, Gloucester, and Middlesex, counties in the middle of the marl region of Virginia, marl has been already extensively applied, and the profits therefrom are annually increasing. And in other surrounding counties, worse supplied with marl, the practice has been carried on in proportion to the facilities, and to the more scanty experience and degree of information on the subject. It would be a most important statistical fact, if it could be ascertained how much land in Virginia has already been marled. The quantity however is very great; and all the land marled has been thereby increased in *net* product, on the general average, fully 8 bushels of corn or oats, or 4 bushels of wheat—and the land increased in intrinsic value fully 200 per cent. on its previous value or market price. Where the marling has been judiciously conducted, these rates of increase have been more than doubled. From these data, might be calculated something like the already prodigiously increased values and products due solely to marling, and which will be still more increasing from year to year. If not already reached, the result *will* soon be reached, of new value to the amount of millions of dollars having been thus created. It is not designed in this hasty sketch to enter into minute details of results, nor to prescribe rules for practice, both of which have been given in other publications. The purpose here is but to state improvements and describe results in general.

It required the improvement by marling, on originally poor or middling soils, (or liming, which in final and general results is the same thing,) to render as generally available the best and otherwise but rarely found benefits, of the two kinds of vegetable manuring recommended by Taylor. When such soils have been made calcareous, by marling or liming, then, and not until then, all the benefits, present and future, that his readers might have been induced to ex-

* See more full account at page 108, vol. i. Farmers' Register.

† See Mr. Singleton's letter, p. 228, vol. iv. Philadelphia Memoirs, and republished, with preliminary comments, p. 89, 2d Ed. of 'Essay on Calcareous Manures'. Also notices of other earlier experiments at same page, and in note at page 36.

pect, may be confidently counted upon. In my own earlier practice—and Taylor had no greater admirer, or more implicit follower—I found my farm-yard manurings on acid soils scarcely to pay the expense of application, and to leave no trace of the effect after a very short time. And land allowed to receive for its support all its vegetable growth (of weeds and natural grass) of two and a half years in every four, and the products in corn having been measured and compared, showed no certain increase in more than twenty years of such mild treatment. Since, on the same fields, farm-yard manures, in every mode of preparation and application, always tell well, both in early effect and in duration. And even the leaves raked up on wood-land, spread immediately and without any preparation, as top-dressing on clover, always produce most manifest improvement, and are believed to give more *net* profit than any application of the much richer farm yard manure, per acre, made on like land before it was marled. This utilizing and fixing of other manures, and the fitting land to produce clover, which effects of marling are in addition to all the *direct* benefit produced, would alone serve to give a new face to the agriculture of the country. Whatever may be done by clover, and almost every thing that can be done to profit by vegetable manures, on the much larger proportion of the lands of lower Virginia, will be due to the application of marl or lime.

IV. Liming.

The kindred improvement by liming began to be extensively practised on some of the best James river lands, where no marl was found, soon after the use of the latter began to extend. Who may have made the earliest and small applications of lime is not known, nor is it at all important. The earlier profitable use of lime in Pennsylvania, and the much earlier and more extended use in Britain, were known to every well-informed or reading farmer. Such a one was Fielding Lewis of Charles City, as well as a most attentive, judicious, and successful practical cultivator and improver. He is believed to have been the earliest considerable limer, and the one who obtained the most manifest profits therefrom, and whose example had most effect in spreading the practice. Some of his disciples and followers have since, in greater rapidity and wider extent of operations, far surpassed their teacher and leader—to whom, however, they award the highest meed of praise for bringing into use, and establishing this great benefit to the agriculture of lower Virginia. Nearly all the best soils on James river are comparatively of low level, as if of ancient alluvial formation, and have no marl with which the neighboring higher and poorer lands are mostly supplied. Of such rich lands, are the farms of Weyanoke, Sandy Point, Westover, and Shirley, &c., in Charles City, and Brandon (Upper and Lower,) in Prince George—and on all these lands, as well as some other, lime has been largely applied. The use is extending to the lands on all the tide waters of the state; and it has recently received a new impulse from the low price at which northern stone-lime is now brought and sold. It is ready slaked, and the vessels are loaded in bulk. The lime is sold on James river at 10 cents the bushel, and even may be contracted for at 8 cents, from vessels that come for cargoes of wood, and would come empty but for bringing lime. The greater lightness and cheaper transportation of lime, will enable it to be applied where marl could not be carried with profit; and with the two, there will be but little of lower Virginia which may not be profitably improved by calcareous manures.

V. Introduction of clover, and its application directly as manure.

As has been already observed, incidentally, the clover culture of Virginia is due to the previous use of calcareous manures. Without enough of lime, or some combination of lime, to constitute a really good soil, and still more on sandy lands, as most are in lower Virginia, it is almost impossible to raise clover at all, and always unprofitable to attempt it in field culture, and as part of a regular rotation. It is true, that on some of the best and richest natural soils, such as were just above named, and on the repeatedly and long manured house lots of worse original soils, some good clover had been made. But even there, the products were precarious. Field culture of clover was out of all question, and failed wherever attempted in lower Virginia, except on the best and very peculiar natural soils. It may even be doubted whether it was any where so productive, and so certain, as to be a profitable and regular manuring crop of the rotation. But after marling or liming, clover grew much better on the few places on which only it could be raised at all before, and it also became a crop as sure as any other, and *naturalized* as it were, on the before foreign and altogether unsuitable soils. It is true that marl or lime, alone, will not produce heavy crops of clover on very light or other very poor land. But even there, a good and healthy "stand" of clover is readily obtained, the plants taking and keeping possession of the ground, and are fit to be raised to a heavy crop by other auxiliary means—such as putrescent manures, and also gypsum, and perhaps green-sand. For according to the present feeble and uncertain lights on both the latter substances, the balance of testimony, furnished by my own experience and the operations of other persons in lower Virginia, is in favor of their acting well as manures on clover generally on naturally calcareous or marled and limed land, as well as of their having no useful effect an acid soils.

Clover is a most valuable addition to the comforts and minor profits of a farm, and also as an indirect fertilizer, by increasing the supply of animal manure. But its great benefit is different from, and superior to all these—and is to be secured by the crop being turned into the soil, and thus serving directly as manure for the crop of wheat to be sown thereupon. This process of culture, and mode of manuring, though not original in lower Virginia, but derived from the upper country, is believed to be peculiar to the United States. For though it be called by the same name, (fallow,) as is the best preparation for wheat in Britain, the two processes, and their designed and actual effects, are altogether different. In Britain, the object is to cleanse a field which had became foul with the grass and weeds which had been encouraged to grow and take possession of the land, by the moist climate, and

the want of enough hoed crops (like our Indian corn,) in the British rotations. And the object is effected by repeated ploughings and cross ploughings, harrowings, raking and hand-picking of root weeds, continued at intervals through a whole year, during which the land is kept as naked as possible. On the contrary, in the perfection of what is so improperly called "fallow" for wheat in Virginia, a heavy growth of clover is raised, and, the second crop, if not also the first, (as is the practice of some of the best farmers on James river,) is left ungrazed and unmown, to be well turned under in August or September, by good ploughs drawn by 3 or 4 horses; then to harrow the new surface, and close the seams between the furrow slices; and without more stirring of the earth, (if possible,) to sow wheat thereupon, at the proper time, and cover the seed with harrows if soft, or such other shallow cutting implement, as the degree of hardness of the surface may require. The object is to have but one, and that a good ploughing; (unless the quantity of wire-grass or blue-grass compel a subsequent shallow ploughing;) and this restriction to one ploughing is not only to save labor, but to secure the clover manure below, and out of the way, and to keep a clean surface above, of which the tilth and mellowness are maintained by the gradual yielding and sinking of the mass of clover turned under. Such a coat of clover is an excellent manuring for the wheat succeeding, and moreover has been obtained at small cost, as its broad leaves drew its principal nourishment from the atmosphere. The smothering growth, also, of thickly set and rank clover, serves to keep the land clean of almost every thing but the clover itself, which is ploughed under deep enough to be effectually put out of the way of the succeeding wheat. The total and sudden change, also, of the condition of the field, by the ploughing and complete burying of the clover, and the leaving for some time a perfectly bare surface, must serve to starve and destroy nearly all the depredating insects that fed on the clover, and which, if not thus destroyed would continue to feed on the wheat. Thus *wheat on clover*, if well managed in all respects, is an admirably clean crop, both from weeds and from insects, and is heavily manured by the clover, which experience has proved is well adapted as a manure for wheat. Hence, it is not strange that the very best crops of wheat that can be obtained from the land, are raised by this mode of manuring with clover.

In speaking above of the practice of ploughing in clover to precede wheat, as being peculiarly American, it was only meant in reference to it as in regular and profitable use, and forming a part of the ordinary system of rotation and culture on some farms. The like explanation and understanding should be applied to several other things spoken of in this piece, as new improvements here. It is certain that the ploughing under of various green crops, as manure, and especially clover, has been sometimes done in Britain in modern times, and still more formerly in Greece and Italy, judging from the recommendations of the practice by ancient writers. "But," says Sir John Sinclair, "notwithstanding the recommendations of the ancients—notwithstanding the great need of manure—and the excessive price of every extraneous article of that description—this practice is now in a great measure abandoned. Peas, buck-wheat, clover, and other juicy plants, when ploughed in, yield no doubt a portion of manure; but they do little more than *restore* the nourishment they had abstracted from the soil; whilst it is extremely difficult to plough down rank vegetables in a growing state, so as to cover them in a complete manner. The farmers of Scotland are, therefore, of opinion that the only way of securing the highest degree of benefit from green crops, is to cut and bring them into a state of putrefaction, before they be applied to the soil." (General Report, &c., of Scotland, vol. ii. p. 530.) That, in the very different circumstances of Britain, the ploughing in of green clover may be bad economy, may be admitted, without affecting the propriety of the practice in Virginia. The like admission may apply to sundry other processes which are proper and economical and preferable here, and which would be the reverse in Britain, in Flanders, and still more in China. But the distinguished and able agriculturist above quoted was altogether wrong in his main theoretical ground of objection, viz.: that crops ploughed under only *restore* to the soil as much as they had previously abstracted. He forgot, or was not aware of the much larger portion of their substance which most plants, and especially clover and other broad-leaved plants, draw from the atmosphere and form into substantial vegetable matter, from the elements of air and water. But for this, the most bountiful provision of nature for the productive power of the soil, the draught therefrom on every farm, would regularly exceed the returns by manuring, &c., by the whole amount of crop sold off; and certain and rapid exhaustion, would necessarily be the consequence, to every part of the cultivated face of the earth, not regularly and abundantly supplied with putrescent manures from abroad. Yet all know that but a small proportion of the products of a field being returned as manure, will serve to maintain, and under favorable condition of soil, &c., may even greatly increase its productive power.

Perhaps there is no improving process or general practice, of one country or district, and however peculiar to it, that has not been used in some, and it may be many, isolated cases elsewhere. But, the very fact of such trials, however numerous, being rare and remaining separate, and not becoming general practice even on a few farms, is enough to prove that the processes or plans were not found profitable—and that such practical operations were but exceptions to the general rules of approved procedure. If there is any one of the modes of enriching by putrescent matters here spoken of, which might be supposed altogether new, it would be the plan introduced by Taylor, of manuring land by its own vegetable cover, wholly or in part, left to decay on the fields. Yet even this was advocated in Scotland, by Lord Belhaven, in 1707, and his publication is quoted by Sinclair, for the purpose of strongly condemning the opinion. The passage from Lord Belhaven is as follows: "I must say, by-the-by, that if in East Lothian they did not leave a higher stubble [when reaping grain,] than in other places of the

kingdom, they would be in worse condition than they are, though bad enough. A good crop of corn makes a good stubble; and a good stubble is the equallest enriching that can be given." (The Country Man's Rudiments, p. 23.) On which Sinclair remarks, "Such sentiments are now condemned by the practical farmer, whose object it is to cut and to bring home the whole, or nearly the whole straw; under an impression that, *unless it be brought into a putrefied state in the fold yard, little advantage, as a manure, can be obtained from it.*' (General Report, &c., of Scotland, vol. ii. p. 510.)

VI. Top-dressing with putrescent manures, and especially on clover.

After allowing all merit due to the improvement to be made by collecting, and to the greatest possible extent, more vegetable materials for farm-yard and stable manure—and also for the greater benefit of applying such manures on lands marled or limed, there would still remain a powerful obstacle to the extension of manuring, in the enormous amount of labor required, on Taylor's proposed plan, to carry out the manure in the spring, and plough under for corn before planting—to say nothing of the difficulty of tillage, and of danger to the young plants in dry weather, by the presence of 50 large ox cart loads (4 oxen for each,) per acre, the quantity of which he speaks. In so short a time, and in a busy part of the year, it is impossible, with the ordinary force of the farm, to carry out, spread, and turn under in proper manner, all the manure that could be made from all the offal of a grain farm—independent of the leaves and other materials which ought to be used. If, to lessen these difficulties, the manure be earlier heaped and fermented, then indeed it is made more manageable and more speedily operative; and the time for applying it is extended. But, on the other hand, the *whole* labor is increased, and the manure loses much of its fertilizing principles by fermentation. A third choice remains, which is to leave in the farm-yard, without heaping, and undisturbed, either all the manure, or all that cannot be conveniently carried out before planting the corn land intended to be so manured. The balance, or the whole so left, rots slowly through the summer, and may be carried out in September on the clover land, to be ploughed immediately for wheat; or otherwise kept until the next spring, to be ploughed under for the corn crop. In the first case, there is lost the use of the manure for six months, and in the second for a whole year; and in both, during the delay, the manure must lose much of the gaseous products of decomposition, which there is nothing growing to receive and secure. I have tried and suffered loss by all these three courses; and was fully sensible that in all, either the waste of manure, or the loss of its use by delay was very considerable.

The plan of top-dressing is an admirable means of overcoming most of these difficulties—and indeed all the important difficulties, if there be no *greater* waste of the fertilizing principles of manure spread on the surface of the soil, and no less benefit to the growing crop, than if the manure had been buried by the plough. Both these points are disputed, and there have been no careful or conclusive experiments made to decide the question. But from my general experience and observation, and now general practice for 12 years, I am satisfied that the evil of the greater waste of manure or of its effects, if indeed there be any greater, is not to be compared to the great saving of expense, found in applying the manure as top-dressing on clover, in March and April, or even somewhat later. When thus applied, and spread evenly and immediately, as it should be, the first rain carries into the earth all the soluble and active parts, and they are absorbed immediately by the roots of the clover, the growth of which will show the benefit in a few days. The coarse parts of the manure, are soon covered over and kept shaded and moist, by the growth of the clover, and thereby the rotting is both hastened, the products preserved better from waste; and every rain carries to the roots, and puts them to immediate use, as food for the growing plants. Thus, a good growth of clover is made even on inferior land, and perhaps by food that might have mostly gone to waste, if the manure had been fermented and made hot in the heap—or more slowly, by lying spread during all summer over the cattle yard. And this clover manure, being more than half derived from the atmosphere, would be worth to the succeeding crop of wheat or corn, more than double the prepared manure it fed upon and consumed. The saving of labor also is great. The mode of application permits the manure to be carried out in any state, from the time of the earliest beginning of the spring's growth of clover, to the first of May; and, if not before so used, even if put out at any time in summer, would do as well, except that the benefit of helping the earlier growth would have been missed. But as to summer-made stable manure, which is so generally injured by fire-fanging, if bulked, or wasted, if spread open in the stable yard, it is decidedly better to spread it on clover, during all summer.

The best application of top-dressing is to clover, because every portion of the manure so used by the clover, is converted to (probably) double the value of the manure in clover, ready to be again used by the wheat the same year. But though clover, as a broad-leaved leguminous plant, (or of the pea tribe,) draws more of its nourishment from the atmosphere, and gives more of manure to the next crop, than any other grass, still, if clover were not at hand, the top-dressing should be given to any grass or any weeds that stood thick enough soon to cover and shade the manure, and to increase the growth of which would be beneficial to the land, and to the succeeding crops.

But there is another material for top-dressing to which there can be no objection on the score of supposed waste, or because any thing better or more economical could be done with it, and which application is highly beneficial. This is leaves raked up in wood-land, and laid on young clover, in winter or spring. Valuable as is this material, on account of its abundant quantity, and usual cheapness of supply, it is very poor in quality compared to straw; and would perhaps not be worth the labor of double hauling and twice handling, required to carry it through the farm-yard to prepare it for manure. And dry or unrotted leaves would be very troublesome to plough under, and if thick might do more harm than good.

But when spread on clover, not too thickly, immediately from the woods, there is little trouble, no possibility of injury, and a decided improvement to the clover, and of course to the next wheat crop, and to the land. Wheat straw, spread in July, or later, on the young clover sown the year before, is also a valuable manure; and may be applied most advantageously on the poorest spots, by bringing back to the field return loads of straw, when carting the wheat from the field to the thrashing machine.

Another, and perhaps the best mode of dressing by pine leaves, (which are best, because they will not be blown away by high winds,) is on wheat, as soon as possible after it is sown. This is too busy a time for much of such manuring to be then done. But it will be especially beneficial to such extent as it can be done. When so applied, the leaves, merely as covering, protect the wheat from being killed by the winter's cold, and from violent alternations of temperature. And they do the same for the clover sown afterwards, and also protect the young plants by shade and moisture. And besides these merely mechanical modes of action, the leaves serve as well as manure, both to the wheat and to the clover, as they could in any other mode of application. An important objection however to this mode may exist if the leaves serve to shelter and protect chinch bugs, as coarse farm-yard litter does, if thus laid on wheat, when those destructive insects are numerous.

Two other modes of top-dressing have been practised and approved by good farmers, in different parts of Virginia. The first is of well-rotted manure, applied on wheat during winter and spring. It was practised by Mr. Richard Sampson, and his account of it may be seen at page 58 vol. i. of Farmers' Register. The practice is doubtless good when manure so rotted is on hand, and the most convenient application is to the wheat field. The other mode, which was in use on some of the Rappahannock farms, was to apply the coarse unrotted manure on the surface of the corn-field, after the corn had been planted, or had come up. I have also practised this plan when much more convenient to do so; and would care but little to choose between this top-dressing and ploughing the manure under, before planting the corn. But neither to wheat or corn ought the top-dressing to be given, if the clover land is as convenient, and as much needing the manuring.

VII.—Rotation of crops.

One of the best indications of the agriculture of any region being in an improving state, though this improvement be not yet much extended, is the regard recently paid to the proper principles of rotations of crops. And if no regard be had to this part of husbandry, there will not be good farming, no matter what may be the goodness of the soil, or the industry and skill of the cultivator. If judged by this test, the agriculture of lower Virginia is making good progress towards an improved state, though yet very far below the point aimed at. There is no rotation universally admitted to be the best, even under the same and most favorable circumstances. But almost every intelligent farmer at least exerts his reasoning faculties on this subject, and adopts such rotation as his judgment makes out to be the best for his particular circumstances. Still, no one of even the best farmers and most successful improvers, seems to be entirely satisfied with his own system of rotation. And this very discontent serves to prove that each one is striving to find out and to pursue what is the best course, without being bigoted to even that which he so far prefers. These remarks however apply only to a few of the best farmers; who, however, as in all cases when agreed themselves as to the best courses, will serve as exemplars and guides to all others who can or will profit by any instruction or example.

The Eastern Shore two-field rotation, of 1st, corn, 2d, oats, followed the same year by volunteer Magothy bay bean, serving as a manure crop for the corn of the next (the third) year, however scourging, without great attention to manuring, is a rotation sustained by reason, as well as by experience.

The old three-shift rotation, common on the greater number of farms which have any rotation at all, or where there is any thing deserving the name of farming, is 1st, corn, 2d, wheat or oats, 3d, the field at rest from tillage, but under close grazing. This is a most exhausting course. But the same frame-work, altered only by the land being limed, regularly sown in clover on the wheat, and the clover grazed only slightly and late in autumn, and the greater part turned in for manure, is a very improving, cleansing, and altogether excellent rotation for light loams, or good corn lands. This is the rotation on the lighter of the two Upper Brandon farms, belonging to Mr. Wm. B. Harrison.

The rotation most approved, however, and most practised by the best farmers on James river, and also on the lighter soils of the Messrs. Wickham, on the Pamunkey, is the four-field rotation, of 1, corn, 2, wheat, with clover sown, 3, clover, turned in for manure to 4, wheat. This seems to be a very severe rotation, and is even so considered by some of the best farmers who pursue the plan. However, this rotation, with all the objections to it, both theoretical and practical, is connected with and serves to exhibit most admirable and profitable farming, and also improvement of land such as may well compare, in these respects, with any in this country. Such a rotation *demands*, and will not do without, a good soil, good manuring, good clover, (and therefore marling or liming, or a naturally calcareous soil,) good teams and good ploughing, and in every respect good farming. He who can meet all these requisitions will succeed admirably, both as to profit and improvement, with the four-field rotation; but if he falter in the work, he will be soon obstructed by insuperable difficulties, and be defeated, and driven from this course of cultivation.

VIII.—Implements of husbandry and tillage.

Great improvements have been made within the last 25 years in agricultural utensils and machinery. Before that time, two-horse ploughs were rarely used, and only on the few richest and best cultivated farms, for breaking lands generally, and on the rich low-grounds and perhaps a few acres more of lots, on some other farms of middling grade, as to fertility and management. On the far greater number of farms there was neither a two-horse plough, nor a mould-board plough for

a single horse. Ninety-nine acres in the hundred were broken up by one-horse ploughs; and half of the whole quantity with the trowel-hoe, or fluke-hoe plough, having cutting wings to the share on both sides alike, and no mould-board. The ploughing was rarely deeper than three inches, (often less,) and even that depth, on the naturally poor lands, often reached the barren subsoil. Harrows, and the advantages of harrowing, to get rough ploughed land in good order, which no farmer can now dispense with, were scarcely known. On most farms, the only approach to a harrow was the "drag" with large wooden teeth, used to smooth newly sown wheat land, after the seed had been covered by the trowel-hoe plough. The wheat was almost universally trodden out of the straw by horses (sometimes aided by oxen) on the earth, and out of doors. Thrashing machines, (and those very inferior, on the old Scotch plan,) were not on half a dozen farms on James river, and perhaps not thrice as many in all eastern Virginia.

It can now scarcely be conceived how land could be broken up, and left in tolerable order by such ploughs and ploughing. Nor could it be done on even the poorest land, if suffered to be at rest long enough for its surface to be clothed with grass, or the earlier and more scant growth of weeds to remain. But most of the farmers who broke up their corn fields with trowel-hoe ploughs, secured the feasibility of the process by cultivating the land in corn every other year, and grazing as close as possible the intervening years. Of course there was no turf, and scarcely a living root, on poor land. Very many did not break up the land at all, at first, but merely ran a furrow with the trowel-hoe ploughs along each of the former corn-rows, checked by similar cross-rows, then planted, and ploughed the intervals at leisure some 6 or 8 weeks after, when the corn was several inches high. Many persons objected altogether to using mould-board ploughs, believing that turning over the furrow slices would exhaust the soil by greater exposure to sun and air.

Since, perhaps the error has been in the opposite direction. Many improving farmers have been even too ready to buy new and highly priced ploughs and other implements; and there are but few who have not had to throw aside, as worthless, at least as many kinds of new implements as they have retained. However, ploughs of good construction are now in general use. Two-horse ploughs are common wherever there is any farming better than the worst; and three-horse, and even four-horse ploughs are used where the natural depth or subsequent improvement of soil requires ploughing 8 or more inches deep. Good thrashing machines, either fixed or portable, of several kinds, are in general use, except on very small farms; and many a large wheat farmer would now abandon the culture of wheat, rather than to have to return to treading out every crop, as formerly.

The processes of tillage have improved with the implements for tillage; and imperfect as both yet are, these two improvements are now more advanced than the more important improvements of the fertility of the soil, and the preservation and economy of the means and resources for fertilization.

Defects of agriculture still remaining.

What has been said of improvements made, will prevent the necessity of treating of the remaining defects of agriculture at much length, copious as may be that subject. The most important defects may be despatched in a few words, as they are either the omitting, or negligently and imperfectly executing, any such of the foregoing named improvements, as may be suitable and wanting to the particular circumstances of each farmer. But there are also minor branches of these several general subjects, and also other distinct subjects, of neglect or omission, which remain to be briefly considered.

In regard to the application of marl—although it has been more universally or generally and extensively adopted and practised than any other as new and as great innovation in agriculture, and although the unusual rapidity with which the new practice has spread, is as remarkable as the extended space of operations, still very few of those farmers who have adopted this mode of improvement have operated properly, or to half the profit that even their actual expense therein, if properly directed, would have returned. The far greater number of persons commence and continue the always heavy business of marling, without providing for it any additional force, or suspending any of the previous cultivation and full employment on their farms. Few had before been able to perform properly all the ordinary labors required; and yet they count on marling their whole farms with no more labor than was before engaged. They marl only "at leisure times;" and for want of regular and continued operations, very little can be done at all, and that little at double cost. But suppose that there were no such disadvantages, but only the slower rate of work, and that the owner of 600 acres to be marled, could cover 10 acres a-year at odd jobs and leisure times, or 100 acres by merely suspending a third of his cultivation, and devoting the labor so released to regular and continued marling. In the first case 36 years would be required to marl the whole surface, and in the latter only six years. In the latter case there would be no diminution of product by the lessened tillage, even in the first year; for the two-thirds of the first field marled would yield, in the first year, more (and usually much more) than the whole without marling. And the increased rate of product of the farm, at the end of the 6 years serving to marl the whole, would more than pay for thrice the labor usually required for the marling. The mere difference to the farmer of having his land all marled, say in 1842, or not until 1852, would be the loss of the increased product for ten years. And on most of the lands of lower Virginia, that increased product, from marling alone, would be equal to half the gross product, (or 100 per cent. on the original product,) and would amount to more in 10 years than the previous fee-simple value of the whole farm. He who has determined to marl his land, and yet delays to do it, is thereby submitting, during the delay, to a loss in every crop fully equal to all that is made on the unmarled land in tillage.

But putting aside this enormous waste of value, incurred by mere delay of operations, the marling actually done, (and at double cost, from irregular working and want of method,) does not yield

half the available returns, because of ignorance or carelessness in the application, and the subsequent treatment of the land. Frequently, the quantity applied is unsuited to the nature and wants of the soil. Sometimes, from variation in the strength of the marl, and the proprietor being ignorant of the quality, or, more often, from irregular spreading, injury is done, and loss sustained, by there being too much marl on some parts, and too little on other parts, of the same field, and sometimes even of the same acre. Again, if the time and manner of application be never so judicious, and the improved fertility be never so great at first, half the surely available future profit will be lost, if the subsequent management be as improper as it usually is in almost all cases. Under ordinary tillage and management, and a rotation merely *not* exhausting, (say the three-shift, without clover and without grazing, and very little manuring,) marling may, and probably will, give a *permanent* increase to the crops of between 50 and 100 per cent. But if clover be sown, and partly or wholly ploughed under as manure, and if the *increased* supply of materials for farm-yard manure be all used, (which also will be due entirely to marl,) these means will in a few years double the direct effects of the marl alone. The whole permanently increased product, thus to be made by the most judicious marling (and the same, it is presumed, of liming,) and subsequent operations, on the ordinary acid soil of lower Virginia, might be safely counted as four-fold the previous gross products; and a ten-fold increase of the net profit, and also of the intrinsic value of the land. Yet the loss, or failure to obtain, the much larger proportion of this increase of value is borne by nearly all of those who apply marl, because they will not attend to the properties, and the mode of operation of the manure which they are using.

Having begun to marl without any guide whatever, or source of proper instruction, except my own theoretical views of soils and manures, I have myself committed more or less of every serious error above referred to, and suffered something from every kind of loss; as well as having realized enough of every benefit promised, to know what greater and more speedy general profit a proper conduct throughout would surely produce. My mistakes and losses, necessarily caused by the ignorance and inexperience of an uninstructed novice, and pioneer in a totally new business, may serve to guard from the same all followers; and they, being so guarded, may enjoy all the benefits of marling, unalloyed by any of the risks and losses of ignorant beginners. But it is a subject of regret, and of great public as well as private loss, that the actual results are very different. It is as if each new beginner were resolved to learn nothing from the previous experience of others, but prefers to owe all knowledge to his own errors and losses.

In regard to putrescent manures, there are very great and very general defects of management. On acid soils there is excuse for neglect of manuring, for it scarcely pays the cost. But on well constituted natural soils, and on naturally acid and bad soils, after being marled or limed, too much labor cannot well be given to collecting all the farm materials for, and applying putrescent manures. But even of the quantity of materials operated on, in the farm-yard and stables, there is great waste of enriching principles permitted, in various ways, but more especially by fermentation, whether the manure be heaped, or not heaped, or carried out on the fields before rotting. And such waste must take place, if decomposition of the manure proceeds, and its gaseous products be set free, when there are no growing plants present, or not enough of them, to absorb and put to use the fleeting fertilizing principles.

The neglect of proper drainage is another great defect of our agriculture, affecting not only the profits, but the health of the lower country. On almost every farm there is something of this defect. But in the low and level lands of the south-eastern counties, the whole region suffers from excessive wetness, which might be easily removed by a proper system of drainage and of tillage suited to that object. Princess Anne and Norfolk counties might be raised from their present most wretched agricultural condition, to their proper grade of fine and productive and valuable farming lands; and even the rich lands of Elizabeth City, and the now fertile and productive farms of the more carefully cultivated and beautiful low lands of Gloucester, might yet be greatly improved in value, by more thorough and general drainage.

A great defect on almost every farm to some extent, and entirely on most land, is the neglect of grass crops for hay. Even the small extent of clover husbandry, admirable and profitable as it is, scarcely forms an exception to this defect; for the clover is turned in for manure, and rarely converted to hay. On some of the best farms, and where the benefits of clover-manure have been best known by experience, as Westover and Brandon, the proprietors deem this use so much the more profitable, that they would consider the conversion of any considerable portion of the clover crop to hay as a wasteful abstraction from the product of the field under the succeeding crops. But without undervaluing the worth of clover as manure, I doubt whether these excellent farmers and improvers do not in this respect adhere too closely to their system. Before forming the seeds, which is the exhausting part of the growth, the clover has drawn nearly all its nourishment from air and water, and taken very little from the enriching ingredients of the soil. If then the first crop were mown for hay, before the seeds had been formed, there would be the following benefits derived, at very slight cost to the land: 1st, the hay, for farm consumption, 2nd, the cutting off by the scythe and destroying all annuals not then having seeded—and the keeping down of all perennial weeds, shrubs, and bushes; 3d, the having a clean second or summer growth of clover, to furnish seed if desired, or otherwise thus made free from the smothering and sometimes destructive cover of the dead first or spring crop. Of course, the mowing should be on clover of good size, and where the coarse manure had not been applied.

But putting hay from clover aside, there is general neglect of natural meadows, and still more of artificial grasses on the low and moist spots, which would be very profitable under permanent grass, and are worth but little as arable land. Yet hay, either for sale if near to market, or for consumption on the farm where needed, is per-

haps the most valuable crop of suitable land, and certainly the crop most cheaply made. For want of attention to grass husbandry, our towns continue to be supplied with hay imported from New England—and our corn crops are stripped of the leaves for fodder, though the cost of labor so employed, and the injury to the grain, must amount to much more than the value of the fodder so obtained.

A region in which hay is scarcely made at all, and grass so much neglected, must necessarily also show poor live stock, and small profits therefrom. To both these bad courses we have been seduced by the quantity of cattle-forage furnished in the offal (shucks and stalks) of our large corn crops. But all that even this bountiful supply permits, is that the cattle may live, gradually becoming poorer, through winter and spring, and yielding through the year little or no net profit, except in furnishing supplies necessary to the comfort of the family, in milk, butter, and meat, and of manure to the land.

We raise not enough hogs, for the home supply of what is the principal animal food of the country; though this great defect is rapidly becoming less. We raise very few horses for labor. Sheep are not to be found at all on most farms, owing in a great degree to the risks they would incur from dogs. If every useless and worthless dog in lower Virginia were a sheep or a hog, the expense of maintenance would be less, and the returns to agriculture greater by many thousands of dollars, besides the rendering the raising of sheep in general safe and profitable, instead of being as hazardous as if the country were infested by wolves instead of by worthless dogs.

ON THE COMPARATIVE MERITS OF THE ISABELLA AND CATAWBA GRAPES; WITH A NOTICE OF A NEW NATIVE VARIETY CALLED THE OHIO GRAPE, AND OBSERVATIONS ON THE CULTIVATION OF GRAPES FROM SEED.

By N. Longworth, Esq., Cincinnati, Ohio.

From the Magazine of Horticulture.

I was surprised on reading a communication in your magazine, (vol. vii., p. 331,) from an intelligent gentleman at Marietta, Ohio, in which he speaks of the Isabella grape as the best native grape cultivated by them, and that they commence using it for the table as soon as it assumes a red color. I should suppose he alluded to the Bland Madeira, did he not speak of that grape in a subsequent part of his letter. I have ceased to cultivate the Isabella for near twenty years, deeming it inferior, as a table and wine grape, to most others. He gives it the preference over the Catawba, as a table grape; with us, it ripens badly, and is subject to rot, and in its best state far inferior to the Catawba, either for the table or for wine. I have had a bunch of the Catawba to weigh twenty-four ounces. I have a white variety of the Catawba, and another Catawba producing fruit a third larger than the Catawba of Adlum. I say the Catawba of Adlum, for Major Adlum was the first to bring it into notice.

I have three varieties of native grapes, which I consider far superior to the Catawba for the table. They have none of the hard pulp common to the Catawba, Schuylkill, Muscadel, and the Isabella. For the table, they are equal to the Meunier, or Miller's Burgundy, and as free of pulp. One of them, which I first met with a few years since, I call the Ohio grape. The vine is perfectly hardy, a fine bearer, has never had the mildew or rot, and the bunches very large, say four times the size of the Burgundy. I sent a bunch of these grapes to Boston, last fall, but it was too long on the road to be in perfection. I will give five hundred dollars for a root of a native grape, that in quality of the fruit and size of the bunch, shall surpass it. The other two are equally good for the table, perfectly hardy, great growers, but the bunches of fruit are not so large.

I was surprised, when east, to find no good native grapes. At my different vineyards, I have about sixty acres in grapes, but not all in bearing. Last season, I had not half a crop, with the exception of one vineyard, where the fruit was abundant and fine. I made about two hundred barrels of wine, and some brandy. I am now raising large quantities of vines from the seed of my best varieties of native grape, having cleared a piece of new land expressly for that purpose.

The Bland grape is not a native. It was introduced into Virginia from France, about fifty years since, by a French gentleman, as I was informed by Gen. Harrison, who knew the gentleman, and had seen the fruit on his table, more than forty years since. It is a good table grape, but subject to mildew, and does not always ripen its wood or its fruit. Yours, respectfully,

N. Longworth.

Cincinnati, Ohio, March, 1842.

LIQUID MANURE.

From the (London) Farmers' Magazine.

Sir,—I beg leave to state to you that, seeing the bad effects of the waste of the draining of manure heaps, and being convinced that much of the substance of the dung was contained therein, I determined on applying it as a top-dressing to a meadow, which was effected in the following manner:—Measures having been taken to prevent the escape of the water, an old tar barrel had a hole about six inches square cut out at the bung; into this was fitted a funnel made of wood, somewhat in the shape of a hopper, having the bottom covered with a piece of old tin perforated with holes, to act as a strainer to prevent straws, or any matter which would choke the passage, getting into the barrel. Two old felloes of a cart wheel, having wedged-shaped pieces nailed on the outer side at each end to keep them steady, were laid in a cart, and the barrel having a hand-plug in the cock hole, was laid on them. A trough a foot longer, the width of the cart, one side of it being bored with a double row of holes burned with a hot iron, was then slung behind, and just under the cart; which, when the cask had been filled with the dunghill water, was then driven on the meadow—the plug being withdrawn, the water flows out on the bottom of the cart and thence into the trough, which through the holes distributes it in the manner of a town watering cart. This apparatus is simple, cheap and effective; and when done with, the

trough and the barrel can be put by, and need not monopolize a wheel-carriage for this particular use.

In going over the ground, the cart should be driven right up and down hill; as if it goes sideways or across the hill, the water will not flow equally from the holes, but will be in one end of the trough; and the track of the wheel points out to the driver where he is to go next turn. The effect with me has been the manifest greenness which is now apparent on all the watered parts, which show a much superior color to the adjacent spots which have not been watered, and I am satisfied that this is the most profitable way of applying that which usually goes to waste.

JANUARIUS.

DESTRUCTIVE INSECTS.

From Dr. T. W. Harris's Report on the Insects of Massachusetts.

Cucumber bug.—The pupa state of some species occurs on the leaves—of others, in the ground; and some of the larvæ live also in the ground on the roots of plants. This is probably the case with those of the cucumber beetle. This destructive insect is the *Galeruca vittata*, or striped galeruca, generally known here by the names of striped bug and cucumber bug. It is of a light yellow color, above, with a black head, and a broad black stripe on each wing-cover, the inner edge or suture of which is also black, forming a third narrower stripe down the middle of the back; the abdomen, the greater part of the fore-legs, and the knees and feet of the other legs are black. It is rather less than one fifth of an inch long. Early in the spring it devours the tender leaves of various plants. I have found it often on those of our Aronias, *Amelanchier botryapium* and *ovalis*, and *Pyrus arbutifolia*, towards the end of April. It makes its first appearance, on cucumber, squash, and melon vines about the last of May and first of June, or as soon as the leaves begin to expand; and, as several broods are produced in the course of the summer, it may be found at various times on these plants, till the latter are destroyed by frost. Great numbers of these little beetles may be obtained in the autumn from the flowers of squash and pumpkin vines, of the pollen and germs of which they are very fond. They get into the blossoms as soon as the latter are opened, and are often caught there by the twisting and closing of the top of the flower; and, when they want to make their escape, they are obliged to gnaw a hole through the side of their temporary prison. The females lay their eggs in the ground, and the larvæ probably feed on the roots of plants, but they have hitherto escaped my researches.

Various means have been suggested and tried to prevent the ravages of these striped cucumber beetles, which have become notorious throughout the country for their attacks upon the leaves of the cucumber and squash. Dr. B. S. Barton, of Philadelphia, recommended sprinkling the vines with a mixture of tobacco and red pepper, which he stated to be attended with great benefit. Watering the vines with a solution of one ounce of Glauber's salts in a quart of water, or with tobacco water, an infusion of elder, of walnut leaves, or of hops, has been highly recommended. Mr. Gourgas of Weston, has found no application so useful as ground plaster of Paris; and a writer in the American Farmer, extols the use of charcoal dust. Deane recommended sifting powdered soot upon the plants when they are wet with the morning dew, and others have advised sulphur and Scotch snuff to be applied in the same way. As these insects fly by night as well as by day, and are attracted by lights, lighted splinters of pine knots or of staves or tar barrels, stuck into the ground during the night, around the plants, have been found useful in destroying these beetles. The most effectual preservative both against these insects and the equally destructive black flea-beetles which infest the vines in the spring, consists in covering the young vines with millinet stretched over small wooden frames. Mr. Levi Bartlett, of Warner, N. H., has described a method for making these frames expeditiously and economically, and his directions may be found in the second volume of the New England Farmer, page 305, and in Fessenden's New American Gardener, under the article *Cucumber*.

The cucumber flea-beetle, above mentioned, a little, black, jumping insect, well known for the injury done by it, in the spring, to young cucumber plants, belongs to another family of the Chrysomelian tribe, called *Halticadæ*. The following are the chief peculiarities of the beetles of this family. The body is oval and very convex above; the thorax is short, nearly or quite as wide as the wing-covers behind, and narrowed before; the head is pretty broad; the antennæ are slender, about half the length of the body, and are implanted nearly on the middle of the forehead; the hindmost thighs are very thick, being formed for leaping; hence these insects have been called flea-beetles, and the scientific name *Haltica*, derived from a word signifying to leap, has been applied to them. The surface of the body is smooth, generally polished, and often prettily or brilliantly colored. The claws are very thick at one end, are deeply notched towards the other, and terminate with a long curved and sharp point, which enables the insect to lay hold firmly upon the leaves of the plants on which they live. These beetles eat the leaves of vegetables, preferring especially plants of the cabbage, turnip, mustard, cress, radish, and horse-radish kind, or those, which, in botanical language, are called cruciferous plants, to which they are often exceedingly injurious. The turnip fly, or more properly turnip flea-beetle, is one of these *Halticas*, which lays waste the turnip fields in Europe, devouring the seed leaves of the plants as soon as they appear above the ground, and continuing their ravages upon new crops throughout the summer. It is stated in Young's Annals of Agriculture, that the loss in Devonshire, England, in one season, from the destruction of the turnip crops by this little insect, was estimated at one hundred thousand pounds sterling. Another small flea-beetle is often very injurious to the grape vines in Europe, and a larger species attacks the same plant in this country. The flea-beetles conceal themselves during the winter, in dry places, under stones, in tufts of withered grass, and in chinks of walls. They lay their eggs in the spring, upon the leaves of the plants upon which they feed. The larvæ or young of the smaller kinds, burrow into the leaves, and eat the soft pulpy substance under the skin, form-

ing therein little winding passages, in which they finally complete their transformations. Hence the plants suffer as much from the depredations of the larvæ, as from those of the beetles—a fact that has too often been overlooked. The larvæ of the larger kinds are said to live exposed upon the surface of the leaves which they devour, till they have come to their growth, and to go into the ground, where they are changed to pupæ, and soon afterwards to beetles. The mining larvæ, the only kinds which are known to me from personal examination, are little slender grubs, tapering towards each end, and provided with six legs. They arrive at maturity, turn to pupæ, and then to beetles in a few weeks. Hence there is a constant succession of these insects, in their various states, throughout the summer. The history of the greater part of our Halticas or flea-beetles, is still unknown ; I shall, therefore, only add, to the foregoing general remarks, descriptions of two or three common species, and suggest such remedies as seem to be useful in protecting plants from their ravages.

The most destructive species in this vicinity, is that which attacks the cucumber plant as soon as the latter appears above the ground, eating the seed leaves, and thereby destroying the plant immediately. Supposing this to be an undescribed insect, I formerly named it *Haltica cucumeris*, the cucumber flea-beetle; but Mr. Say subsequently informed me that it was the *pubescens* of Illiger, so named because it is very slightly pubescent or downy. It is only one sixteenth of an inch long, of a black color, with clay-yellow antennæ and legs, except the hindmost thighs, which are brown. The upper side of the body is covered with punctures which are arranged in rows on the wing-cases ; and there is a deep transverse furrow across the hinder part of the thorax.

The wavy-striped flea-beetle, *Haltica striolata*, may be seen in great abundance on the horse-radish, various kinds of cresses, and on the mustard and turnip, early in May, and indeed at other times throughout the summer. It is very injurious to young plants, destroying their seed leaves as soon as the latter expand. Should it multiply to any extent, it may, in time, become as great a pest as the European turnip flea-beetle, which it closely resembles in its appearance, and in all its habits. Though rather larger than the cucumber flea-beetle, and of a longer oval shape, it is considerably less than one tenth of an inch in length. It is of a polished black color, with a broad, wavy, buff-colored stripe on each wing-cover, and the knees and feet are reddish yellow. Specimens are sometimes found having two buff-yellow spots on each wing-cover, instead of the wavy stripe. These were not known by Fabricus, to be merely varieties of the *striolata*, and accordingly he described them as distinct, under the name of *bipustulata*, the two-spotted.

In England, where the ravages of the turnip flea-beetle have attracted great attention, and have caused many and various experiments to be tried with a view of checking them, it is thought that "the careful and systematic use of lime will obviate, in a great degree, the danger which has been experienced" from this insect. From this and other statements in favor of the use of lime, there is good reason to hope that it will effectually protect plants from the various kinds of flea-beetles, if dusted over them, when wet with dew, in proper season. Watering plants with alkaline solutions, it is said, will kill the insects without injuring the plants. The solution may be made by dissolving one pound of hard soap in twelve gallons of the soap-suds left after washing. This mixture should be applied twice a day with a water-pot. Kollar very highly recommends watering or wetting the leaves of plants with an infusion or tea of wormwood, which prevents the flea-beetles from touching them. Perhaps a decoction of walnut leaves might be equally serviceable. Great numbers of the beetles may be caught by the skilful use of a deep bag-net of muslin, which should be swept over the plants infested by the beetles, after which the latter may be easily destroyed. This net cannot be used with safety to catch the insects on very young plants, on account of the risk of bruising or breaking their tender leaves.

THE SEA DEVIL CAUGHT AT CHARLESTON.

One of the fishing boats in our harbor had a delightful excursion yesterday, without the use of sail or oars. It appears that while the persons in the boat were quietly pursuing their avocation of hooking the finny inhabitants of the deep, off Holmes' wharf, a monster, in the shape of a devil fish, became entangled in the cable by which the boat was anchored, and much to the astonishment of the crew made off with her, taking a direction down the river. Persons on board other boats observing an unusual struggling and splashing in the water, made off to their assistance, and after a hard contest of some hours, (six boats, using some twenty oars, being engaged,) the monster was brought up to town, and became an object of much curiosity, being visited by large crowds. Shortly after reaching the market wharf, it gave birth to a young one, which was landed and placed in one of the stores. The old sea devil measures about fifteen feet from wing to wing, and about sixteen feet in length, being similar in form to the Stingaree. It is supposed to weigh about a ton. The young one is about six feet by five and a half.—*Charleston Courier, 27th April.*

Devil-fish—We have examined the preparation of this enormous beast—which has been made by Mr. R. Waters—and is remarkably well done. Few persons, even here, have ever seen this extraordinary monster, and it is believed to be peculiar to our coast. Take these dimensions for instance—length from mouth to end of tail 16½ feet ; from tips of wings 18 ft. ; of mouth 2 feet 10 inches ; distance between the eyes 5 feet ; weight 3,780 lbs. Among the remarkable peculiarities of structure, may be mentioned the brain, which is small and only protected by the skin of the back—the back bone, which is solid, from the mouth to the tail ; the ribs, so to call them, which hinge in the back bone and run under the skin—about the size of the finger and elastic like whale bone—to the wing—gradually tapering as that recedes to the tail. The general shape is that of a sparrow hawk, with the wings fully extended—wanting the head and tail. The tail of the devil fish is a mere whip-cord. It is provided with a fin on the back, at the tail, which serves for a rudder.

It is not yet settled what this fish feeds on, though it is generally supposed to live by suction, notwithstanding its big mouth. It is armed about the mouth with two fin-like flappers, which are certainly the instruments by which it lays hold of the anchors of boats, &c., though it is by no means certain that they aid it in feeding. On the whole, this may be pronounced the oddest of odd fish, and well worthy of being preserved.

At the north this fish could not fail to attract the wonder of the million, for it is not found in their waters, and differs in a marvellous degree from all the monsters of the ocean.—*Charleston Mercury.*

NEED FOR AGRICULTURAL EXPERIMENTS.—COTTON INSECTS.

Extract from an Address on Agriculture, delivered before the Alabama State Agricultural Society, on 7th Dec. 1841. By the Rev. Dr. Manly.

Experiments for the improvement of agriculture, as they require, when conducted to the best advantage, considerable surplus wealth, much time, patience, and accuracy, and the highest qualities of intelligence ; and as, when successful, they issue in the most momentous results, are worthy the first efforts of genius, and the highest aspirations of patriotism.

No improvements are made without experiments. It is true, they are not absolutely confined to the rich. There is even an advantage, when practical men of limited means, who live by the returns of their labor, can be induced to try them. These will always make them on a plan in which failure will not be injurious, and success will be universally beneficial ; because the poorest may copy out the processes and realize the results. But it is a duty specially incumbent on planters of substantial independence. Some experiments, of course, will be failures ; and such are able to hazard something. The fear of being thought visionary, may deter men from a course of experimenting. And what if the imputation should actually be made ? This is what has happened to every individual who has devoted himself to the enlargement of the boundaries of knowledge. But even visionary schemers are a more deserving class of men than those who will attempt no improvement. For, from the results which they reach, though useless to themselves, wise and practical men will derive important hints ; and thus, incidentally, they do good ; while, as they never set out to get rich, their failure is the less disappointment to them, and they do not need our pity.

I must not be met here, by the inane outcry against " book-farming," and against science as useless to agriculture. I wish not to argue the question on general principles, with this class of objectors. I will advert to facts too stubborn to be overthrown,—to facts, too near the cotton planter's interests and feelings to be disregarded, or overlooked.

Every planter knows something of the depredations of the "*lice*"—the little insect that preys upon the cotton when very young, in the spring. Another familiar enemy is the worm that perforates the boll in August. Either of these is sufficiently injurious alone ; and sometimes they are both, in their seasons, propagated and carried through their transformations in the same field.

Will any planter present consider for himself what average deduction from the cotton crop of Alabama should be made, arising from these two causes ? We know that, in some seasons, the loss amounts to half the crop. And what, in round numbers, is the average market value of the cotton crop of Alabama, unreduced by the depredations of those insects ? The average crop now, is about 300,000 bales ; worth at least $10,500,000. Suppose it diminished one fourth, the average annual loss would then be over $2,600,000. This year has been much less destructive than many years are, perhaps less than the average of years. And yet a single planter of Perry county told me, a few days ago, that in this very year they had destroyed for him, at the least calculation, 400,000 lbs. of seed cotton ; worth $8,000 ! Science, it is true, may cost something, but ignorance costs much more ! We hear much of the burdens of education. But here is a clear annual contribution to *ignorance*, of $8,000 from one man ; and all the planters in the state have contributed in the like proportion.

Science spares the illiberal, the unwilling ; but ignorance, is all-comprehending, inexorable, and resistless.

Now, suppose that any foreign enemy sweeping our coast, or any savage foe lurking on our frontier, should annually levy a contribution, by open force, or secret violence, equal to the depredations of these insects, how would this be entertained ? Although but few persons comparatively were interested, every man in the state would be ready to fly to arms,—the whole power of the general government would be roused to resistance ; and neither land nor sea would furnish hiding-places so remote or obscure, nor fortresses so impregnable, as to shelter the aggressors from merited vengeance. Millions on millions would be lavished, and life profusely devoted, in the patriotic effort to arrest the depredation.

But here is a depredation, that goes on from year to year, " laying taxes without our consent," to an amount not only *indefinite, but absolutely incalculable,* upon the whole body of southern planters, and through them upon the whole union ; and yet the whole body of them, the high-minded and chivalrous, the keen and calculating, the bold, restless, and indomitable together, tamely *pocket* the affront ! The colossal, and almost resistless power of Great Britain could not collect from our feeble colonies in '76, a paltry tax of 3 pence a pound on imported tea, levied without their consent ! But here is the richest production on the face, or in the bowels of the earth, cut off sometimes, by half ; and the richest body of men that ever lived on it, foiled, discomfited, reduced to abject submission, that scarcely thinks of the means of protection, by an insect, a butterfly, a louse, a maggot !

It is already in the minds of some of this audience to say, " This is a providential infliction, and there is no contending against Providence." So are 'briers and thorns' a providential infliction ; but that is no reason why we should not cut them out of our fields. So is sickness a providential infliction ; but that is no reason why we should not seek to prevent and to cure it.

The present state of man is a state of *trial.* As there are many facilities opened up by Providence, for the purpose of trial, not to be used, but avoided; so, there are many obstacles interposed from the same source, not to discourage and thwart us, but to test our ingenuity, resolution, and perseverance in overcoming them. And this is one of them: nor could men be placed in circumstances more favorable for contending with such a foe than the body of southern planters. They have wealth, leisure, and intelligence, and have not been thought deficient in energy. The result to be reached is of such magnitude as should provoke the ambition of the most cultivated, or wealthy. The philanthropist, even, could find no field more fit for the exercise of his high powers.

Were any person possessed of the secret by which in an easy, practicable method, these enemies of the cotton plant might certainly be prevented or dislodged; what might Alabama *afford* to give for such a secret? Millions! millions!

But is it really the case that a remedy for these ills is within the range of science? True science is modest, and does not assume to itself omnipotence, nor even seek favor by boastful pretensions. An answer to that question, however, may be inferred from her achievements in kindred branches of practical knowledge, known and read of all men; and from a view of the nature of the case.

On this subject, as the humble advocate of science, I would content myself with suggesting, that it is possible to capture some of these insects, to keep them supplied, in confinement, with every thing they could find in the fields, to oblige them to carry on all their operations, and pass through all their transformations, under the scrutinizing and unremitted observation of scientific and practical men; who would mark all the phenomena, their periods, their habits, their mode of propagation, their transformations, their winter abodes, and the circumstances which give them influence.

I ask now any plain, common-sense, unlettered farmer, if there is not a glaring probability that such investigations, persevered in, might give the planter a hint by which he could adopt means, at least for the mitigation of the evil, so as to render it comparatively harmless?

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Who will deny the possibility of success, in the instance of the cotton insects? We are sure that ignorance and inactivity will not find a remedy: *perhaps* science may. And the whole cost of the experiment for all time will not amount to the tenth part of what ignorance is now levying upon us, year by year!—It may cost the expense of an experimental farm, with suitable buildings, appurtenances, and apparatus. It may cost the means of engaging the services of some four or five scientific men, skilled in natural history and chemistry; practical, laborious pains-taking men, who will be exclusively devoted to all inquiries affecting agriculture, joined with a communication of a thorough professional education, manual and intellectual, to all classes of our young men, who intend to be planters It may cost this; the setting apart, in a permanent investment, of some $250,000 perhaps, of the people's money, to do what may be styled, if ever any thing on earth could, *the people's own business.*

Could we even suppose it probable that the experiment would fail as a means of extermination of the insects in question, can any reasonable man doubt for a moment what would be the effect on the general interests of agriculture, of such an establishment? A body of able men professionally and exclusively employed in applying the deductions of science to the actual tillage of the soil, to the developement of all its adaptations and resources in every part of the state, to the suggestion and proper trial of every species of improvement in all the productions and arts of husbandry, to the training up, by the union of study and personal labor, of a race of hardy, virtuous, enlightened cultivators of the soil,—the foundation and defence, the bone and sinew, the right eye and arm of the commonwealth?

Gentlemen, it is too plain to admit of a doubt, that such an establishment would, in the course of fifty years, repay to the state in one form or other the cost of the investment, *one hundred times over.* * * * * * * * *

REPORT OF THE CUMBERLAND AGRICULTURAL SOCIETY ON GYPSUM AS MANURE.

To the Editor of the Farmers' Register.

By order of the Cumberland Agricultural Society, at their meeting in November last, the following report is sent to you, with a request that you will give it a place in the Farmers' Register.
Very respectfully, THE COMMITTEE,
BY J. MILLER.

May, 1842.

The committee appointed, by a resolution of the society, to report, "on the benefits of gypsum or plaster, the time, manner, &c., of applying it, to what crops, and on what soils it is most beneficial, and all other information in relation to the subject which they deem important," have had these matters under consideration, and respectfully submit the following report, in part. They say in part, because, as presented to your committee, it is a most fruitful theme, requiring a degree of labor and research which they have not had time to bestow. But such information as they possessed, or have been able to obtain, they freely communicate to the society, as far as they have had opportunity to embody it, feeling very conscious at the same time, that they are communicating little or nothing that is new or valuable; and still more, that they possess no talent for giving to old thoughts a new and pleasing dress. To enter into a formal argument, at this time of day, to maintain the general proposition that plaster of Paris is beneficial to the agriculturist, would prove us a century behind the age in which we live. It is, therefore, presumed that such was not the intention of the society in the reference of this subject to their committee. Assuming this position then as granted, we proceed to the other subjects of inquiry presented by the resolution, not confining ourselves to each in order, but treating them indiscriminately, as they most naturally suggest themselves to our minds, yet, as we trust, intelligibly. Premising that this valuable article can now be procured in our neighborhood, from Stony Point mills to Farmville,

ready ground for use, at $12½ per ton, the farmer taking it away in his own vessels, or at $14 barrelled up, or that it can be got up in the lump, at 9 or 10 dollars, and pounded, (the comparative benefits of which are in a course of experiment by our worthy president, and others near us, the results of whose experience we shall doubtless soon know,) we express it as our opinion that half a bushel or a bushel per acre, prepared in either way, and judiciously applied, is of more benefit to the land and the crop than five times the same quantity of any other manure within our knowledge. To realize all its advantages it must be applied to a clover crop very soon after the removal of the crop of wheat or oats, or the following spring, or both, (February or March is the best time for applying it the second year,) that is, where the clover is the crop for the benefit of which the plaster is used,—or to a clover lay about to be turned in as a manure for some other crop,—or to a coat of vegetable matter or coarse manure about to be ploughed in for the same purpose,—or on checks or drills of manure, especially of coarse manure, on which you are about to hill or bed the land for a crop. The application of it first recommended would, we are persuaded, save many a field of young clover which perishes, in dry seasons, from its sudden exposure to the hot summer sun, after the removal of the crop of small grain which had protected it during the earlier part of the season. We regret that we have no experience of our own to adduce on this branch of our subject; but we learn through one of our body, in habits of intercourse with the farmers on James river, below Richmond and Petersburg, that such is the practice with some of them, and with marked improvement of the clover and the land. We add that, admitting its benefit to clover at all, (on which surely we are all agreed,) this conclusion, we should think, would address itself at once to the understanding, too powerfully to be resisted. A practical farmer, of no ordinary merit, in an adjoining county, mixes his plaster with his clover seed when sowing, in the proportion of a bushel of the former to a gallon of the latter, with the same result. A question has been started whether its application to wheat at that stage, may not increase its tendency to rust. We merely throw out the idea to set wiser heads to thinking, without expressing an opinion upon it. If aught, however, which may add to the sap of the wheat, when there is danger of redundancy, and consequent danger of rust, should be avoided, then it is worthy of some consideration, especially when the wheat crop has, for years, been so precarious, and more perhaps from rust than any other cause. And if the clover and the land can get the full benefit, and an injury to the wheat be avoided at the same time by sowing the plaster after harvest, rather than with the clover seed, certainly it should be done.*

2dly. On clover the second spring. This being the universal and approved practice, where clover is plastered at all, it needs but a passing remark or two. In vain do we sow plaster, if we tread or graze our clover the same winter or spring. Not a hoof should go on it after November. Nay, we doubt whether, if it could be avoided, our young clover should be grazed at all. But we will glean our fields of the scattered wheat and oats; and it would be darting straws against the wind to argue against it. Some judicious James river farmers, it is true, recommend that it should be grazed the first summer and fall to cleanse it of weeds, especially the stick weed. It is very questionable, however, in the opinion of your committee, whether, upon our drier lands this should be done, except, as before intimated, it will be very sure to be done "right or wrong." But when we have gleaned our fields, if we would preserve our clover, or profit by it, and at any event by or after November we must provide pasturage for our stock elsewhere. But what, it may be asked, has this to do with plaster? Much every way. We are required to report on the time and manner of applying it. We answer, in this connexion, sow it on young clover in the spring, not trodden or grazed since the preceding November, for a crop of clover. If you first lighten the soil with a thin, sharp coulter, (supposing it at all close,) you would perhaps do well. February is the best month for applying the plaster; March will do, but not as well.

3rdly. Apply it, half to one bushel per acre, to a clover lay, to turn in for the benefit of some other crop. Many planters, it is believed, keep up their tobacco lots in this way, without deterioration, with a rotation of tobacco, wheat and clover. This, in a tobacco district, is perhaps the most profitable use to which plaster can be applied: and in the spring for tobacco, as late as April, or even May; for corn, as late as March, or 1st of April. In one instance known to your committee the present year, a clover lot was thus prepared for tobacco as late as the 21st of June; and the crop compares advantageously with lots highly manured from the stable and farm-pen. In another instance, where a luxuriant growth of clover was turned in late in February and early in March, without the second plastering, but well plastered the spring preceding, a very heavy crop of tobacco, and of superior quality, is the result. The land has undergone a pretty severe course of cropping since it was cleared, some 9 years ago, viz.: three crops of tobacco, then wheat, clover and tobacco twice; and has been fully kept up to its original fertility, if not improved, by this system of clovering and plastering. Nay, it is believed that the tobacco crop on it this year is the best it has ever produced. These, with many other instances which might be adduced, within our own experience and observation, as well as upon the information of others, convince us that the spring fallowing of clover land, intended for a hoe crop, is better than fall fallowing. But if the planter has more of it than he can do in the spring, or deems it unsafe to defer so much of his ploughing to such a late period, his clover lots intended for tobacco, at least, should be broken up in the spring, with the previous dressing of plaster recommended. The second instance, above referred to, goes far to prove the continuing be-

* Since the foregoing part of this report was written we have conversed with an intelligent planter and farmer of this society who insists that the chief danger to the young clover arises from the great draught on the land by the wheat crop from April to the time of its maturing, and that therefore the best time to sow plaster to obviate it is in April. And, in the single instance in which he tried it, he thought the clover greatly benefited, and that the wheat received no injury.

nefit of the plaster after the first year; and is only one of many going to establish the same fact and giving us assurance that its advantages are not limited to a single year, or single crop, but that, directly or indirectly, it imparts additional fertility to the land for years.

4thly. Apply it in the same mode and quantity to any coat of vegetable matter, or coarse manure to be turned in for a hoe crop. As facts speak louder than mere speculation, we state that one of your committee, some years ago, sowed plaster on half rotted wheat straw, with which he manured part of a tobacco lot, and gave the remainder of the lot about the ordinary coat of farm-pen and stable manure, without plaster, the advantages of the different parts being, in all other respects, about equal. The plastered part was the best tobacco. The peculiarities of the season are not now recollected. He would, by no means, recommend this example to the imitation of his brother planters: it was a last resort in his case, his better manures being exhausted. But what would probably have been the effect of plastering the whole?

Another of your committee, in the year 1836, cleared up a piece of old-field pine land, set with broom-straw, and other coarse grasses and weeds, and partially covered with pine leaves. The land was very poor. He took off only the wood, and such coarse litter as could not be ploughed in, sowed plaster in the spring, ploughed it in, and planted corn. The crop was a fine one for the land, not less than 6 bushels to the acre—while a part of the same land, left unplastered for the sake of the comparison, yielded only 2½ bushels to the acre. The same land now, from the use of plaster and clover, yields 3 or 4 barrels to the acre.

Another member of your committee sowed half a bushel of plaster per acre, on part of a tobacco lot late in April, which had been covered in February by a heavy manuring on clover; on another part, having twice the quantity of manure, but no clover, 1½ bushels. The clovered part made the best tobacco.

5thly. It would seem almost superfluous to say that if plaster acts so kindly sown broadcast on such manures, it must act, with no less effects, on hills or drills of the same. This perhaps may be the more economical way of using it, viz.: checking the land, where to be applied in the hill, and depositing the manure and a table-spoonful or two of plaster in the check, and hilling on the check. Where to be drilled, make a small furrow, deposite the manure, sow the plaster on it, (as much per acre would be required in this way, perhaps, as sowing broad-cast,) and bed the land upon the drill. A very judicious cultivator, a member of this society, being asked by one of your committee, how his tobacco came to be better than most of his neighbors', on land apparently as good, and as well manured? What secret he had, if any, in the preparation or application of his manure? Replied that he had none, unless it was that he drilled his manure altogether, and that not in furrows, but upon the slightest perceptible line, or mark made with a trowel-hoe, the ground being first well prepared; the advantage of which, he said, was to bring the manure sooner to the nourishment of the young plants, at the very stage that they most need it. He was not asked, whether he plasters those drills of manure. Most probably he does, as he uses the article to some extent. But whether he does or not, it would no doubt improve the crop, as well by bringing the manure sooner into action, as by its own magic influence, and perhaps the crop of small grain to follow, and the land.*

6thly. Rolling seed-corn in plaster, or putting a little in the hill when dropping the corn, sowing it lightly on tobacco plants, in the bed or patch, especially when they appear faded or sickly, on plants in the hill at almost any stage, but especially just after trimming down, and just on the eve of a rain, if you can so time it, and soon after topping, are modes of using it with which, it is presumed, most planters are familiar, and the advantages of which they generally appreciate.

7thly. It is recommended by respectable authority, known to the committee, and by Liebig, in his "Organic Chemistry," to use it in the stable, farm-pen and manure bank, by mixing a small quantity with the contents of the stalls, pen or bank, to which it is said to give much greater activity. While we have no experience on this subject, this use of plaster commends itself so powerfully to our reason, and is attended with so little trouble and expense, that we think the experiment worth trying.

On the question "to what soils it is adapted?" we would say that, in our judgment, it is as well adapted to the soil of Cumberland as any whatever. On light, gray land, the general character of ours, where it has not been worn out, with the least mixture of vegetable matter, it acts like a charm. And even where such land is pretty well exhausted, if it has a tolerable subsoil, it is perhaps more easily resuscitated than any other, by the judicious use of clover, plaster and manure. The red lands, stony lands, stiff low-grounds, and creek and branch flats, generally of vegetable mould, or made earth, as we say in common parlance, and even pipe-clay lands, which form the exceptions to the general character of our soil, admit of the most profitable use of plaster. It tells on clover, especially, grown upon red land, as decidedly as on any other. An opinion is prevalent with many, that it does not act kindly on what we call pipe-clay lands, and perhaps it does not as much so as on others. But we are persuaded, that where it has failed of a happy effect on such, or on any, it has been more owing to the land not being well drained, or destitute of any vegetable matter to help it along, if we may so speak, than to any natural incongruity between the land and the plaster. It will not act on a mere caput mortuum, (naked clay) or on sobbed land, however well supplied with vegetable matter. But very striking effects from it are seen on well drained low-grounds of this very kind. The James river bottoms, for example, have generally the subsoil, which gives

* Since writing the above, one of your committee has seen a gentleman who manures for tobacco in this way, *including the plaster*, and who says that the result is superior to that arising from nearly double the quantity of manure spread in the usual way and ploughed in. It cannot admit of any question, however, that the latter would be better for the crops of wheat and clover to follow.

this designation to land. Yet where shall we look for more wonderful results, wrought by the judicious use of plaster? On all lands, then, we would say that it acts beneficially, with the proper accompaniments; and that the Cumberland agriculturist, especially, has great encouragement to try it. And so of crops, the difficulty, in the opinion of your committee, would be to say what it will not benefit, from our most valuable staples, down to the smallest garden vegetable or flower. But its adaptation to clover has been probably the best tested, and its continued application to that crop is yet, we trust, to produce the most marked results, in reclaiming our exhausted, and preserving our rich lands. To other grasses, to corn, wheat, tobacco, oats and peas, it may doubtless be applied, if not with equal, with very encouraging success. All which is respectfully submitted by your committee.

AGRICULTURAL CONDITION OF PENNSYLVANIA.

Extract from the Transactions of the New York State Agricultural Society.

Pennsylvania, in a geological sense, is characterized by a division of secondary and transition formation, excepting a small portion of primitive, in the southeast end of the state. Some geologists contend that we have no well defined primary rock, in the whole state.

While the population continued more sparse, it was not uncommon to see large portions of thin soil run over by the French pioneer system: which, failing to produce on their depleting plan, after a series of crops, was thrown out as commons, or old field. It is matter of interest now, with a more dense population, to see those commons enclosed, and made productive, chiefly by the free use of lime. This manure, being spread on the surface, has sufficient specific gravity to work in; after one or two years, the ground is cultivated, and a rotation of crops commenced. Lime, on these soils, is so effective, that the farmers count on an extra bushel of corn for every bushel of lime. Here I allude, of course, to the poor lands, destitute of carbonate of lime and the constituents of the cereal grains.

The farmers of New-York may form some idea of the use made of lime here, as a manure, when I state that I burn at my own kilns, only three in number, containing from ten to fourteen hundred bushels each, about 40,000 bushels in a year, and there are in the neighborhood some half dozen persons who burn a like quantity; some of which is hauled more than thirty miles, into the southwest of Chester county, and to Cecil county, Maryland. Lime is usually applied, at a rate from thirty to fifty bushels on poor lands, and from sixty to one hundred bushels, on good limestone land. The former practice, of spreading it fresh, in its caustic state, on ploughed ground, preparatory to planting or sowing, is fast giving way to the plan of throwing it in conical piles, to slake and carbonate, after which it is spread on the sod, as a top dressing for permanent pastures, or to lie a year or two, before the ground is ploughed. Lime at the kilns here, is sold at ten to eleven cents per bushel, and as high as twenty-six and eight cents, delivered thirty miles. The value of our first rate land in this county, may be stated from $100 to $120 per acre, according to the value of improvements, convenience, water, &c.

In Pennsylvania, it may be said there are three different systems of husbandry practised.

1st. The cropping system; the usual custom is, to plough a sod field, in the fall or spring, for corn, which is cut up at the ground, following crop oats or barley, then manured and put in wheat; after which it is put down to grass, generally clover, without and with timothy. Clover fields are usually ploughed and sowed in wheat, and make the most certain crop; the following crop, if manured, wheat, and if not, sowed in rye and seeded down to grass. This system is the most laborious, hence it is uniformly adopted by the German farmers, on our best lands.

2d. A mixed system. This system is being adopted in some sections, suitable for it. A portion of the farm is set apart, well watered for permanent pasture, which receives a triennial top dressing of lime, compost, or short manure. Green grass (Poa viridis) naturally obtains, on our strong, calcareous soils, when not broken up by culture, and is decidedly the best grass for fattening. The balance of the farm is conducted, in all respects, as stated in the first named system. This plan I consider *best*, and of course adopt it on my own farm.

3d. This is called the grazing system, and is uniformly adopted, in the eastern counties, near Philadelphia, for dairy purposes and feeding off cattle for the shambles. There is very little farming or ploughing done in this system; merely enough grain raised for the consumption of the family and stock; balance of the whole farm is appropriated to pasture, and hay. Few horses are kept, where this system prevails, oxen being substituted, on the score of economy and profit.

In some of the extreme western counties, stock raising is made the principal business, particularly in Green and Mercer counties, the soil there being adapted to grass. The stock, cattle and sheep are driven east, and sold in Lancaster and Chester counties, to be fed off.

Western Pennsylvania is rapidly improving in agricultural products; raising, according to the late census, about 2,000,000 bushels more wheat in a year than eastern Pennsylvania; the extent of wheat land being far greater west, than east of the mountains. Western Pennsylvania was formerly poorly cultivated, but is now rapidly improving and will far excel us, here, in the eastern part. While we, here, are confined to the Philadelphia market, they of the west have the choice of Philadelphia, Baltimore and Pittsburg, by canal and railway, while the Ohio and Mississippi bear away much of their surplus produce to New-Orleans.

Beet and turnip culture was commenced in this state with considerable spirit, but few continue now to advocate root culture, further than potatoes; like, *and indeed* not unlike, the multicaulis mania, our shrewd and more discriminating farmers allege that both have proved to them, like "faith without works." Draining and reclaiming bogs and swamps, afford another resource, to us, which our

forefathers overlooked, which we find best performed by operatives fresh from the Emerald Isle.

REPORT TO THE STATE BOARD OF AGRICULTURE,

ON THE BRANDON FARMS.

By Edmund Ruffin.

General description of the alluvial and low lands of a part of James river.—The low-grounds or alluvial lands on the tide-water of James river are of two distinct kinds, and both of them very different from what are usually called "low-grounds" on that and other rivers and smaller streams above tide. In all the latter cases, great as is the diversity of soils and their conditions, there would always be understood to be a general agreement in these characters: soils having been formed by the deposites of overflowing freshets, to which the lands are still more or less subject—being wet enough generally to need draining, on account of springs, as well as of inundation—and rich and well constituted as to their earthy, as well as alimentary ingredients. The low or alluvial lands of the tide water of James river, especially from Curles Neck, in Henrico, to Jamestown island in James City county, inclusive, are either of *recent* or of *ancient* alluvial formation. The *recent* alluvial, are the marshes, still subject to be covered by tides, either of common or uncommon height. These lands contain scarcely any silicious sand, and their only earthy ingredients are such as would remain long suspended in slowly moving waters, and subside slowly where the water was still, or the least agitated. Of course, this deposite is still and continually going on, and will continue as long as fine earthy and putrescent matters are washed from the higher country, and brought down by the river. Half the weight and perhaps nine-tenths of the bulk of such soils consist of vegetable matter. But as rich as they are, even the highest of these lands are worth nothing for tillage, and scarcely any thing for grass and pasturage, unless embanked from the tide as well as being drained. And when so embanked, and made dry enough for tillage, the vegetable and putrescent matter, and of course much the larger portion of the soil, run quickly into decomposition, (from which they were protected before, by being continually covered by or saturated with water,) and the land actually *rots away*, until its surface has been reduced so low, that it has became again too wet for cultivation, or even for good grass; when the wetness will again protect the remaining soil from further waste. All the many and very expensive improvements of such lands, by embanking and draining, after a few years of luxuriant and heavy products under tillage, have been lost, and the lands have become again, as at first, worthless for agricultural purposes; and, by loss of their former height, and of their previous fine growth of trees, (if the land had been high enough to bear trees,) these embanked lands, when again yielded to the dominion of the tides, are greater nuisances than before. There is scarcely an estate having such land attached, which would not be made more valuable by the total removal of the marsh. And if all the tide-marshes on the river and its creeks could be sunk twenty feet below the lowest tide, it would be almost as great a blessing to the proprietors, and to the neighboring residents, as would be the draining of all the mill ponds. The marshes, however, as a source of disease, bad as they may be, are exceeded in that respect by the mill ponds. Of course, the river farmers rarely derive any substantial benefit from these marshes, to counterbalance their ill effects.

The only other kind of what may be considered as low-grounds are also manifestly of alluvial formation, but of a time very remote, and when the waters which deposited these lands had an elevation, a volume, and degree of rapidity and power, very far exceeding those of the river now. Generally, where the lands (other than marshes) do not exceed 20 feet in perpendicular elevation above high tide, and are moderately level, they are of this ancient alluvial formation. They are scattered at intervals along both sides of the river, but much the larger part on the northern side, in detached pieces, varying in size from less than 100 to several thousands of acres together. Such lands were at first among the richest of lower Virginia, and for their valuable qualities and general advantages are still among the most desirable farming lands in our country. The well known and valuable farms of Curles Neck, Shirley, Eppes' Island, Berkeley, Westover, Weyanoke, Sandy Point, and Jamestown Island, on the north side of James river, and of small parts of Jordan's Point, Flower-de-Hundred, and all Brandon, on the south side, as well as other tracts less known to the writer, are of this particular formation and character. And though varying greatly, in many respects, they all possess a general uniformity of aspect and of quality, which distinguish them from all other neighboring lands. These general remarks are but prefatory to the particular subject of this report, which will be the two Brandon estates, in Prince George county.

The Brandon lands.—Brandon *Neck*, (the old and still usual name for all bodies of land thus stretching out into the river,) is a broad and low-lying peninsula, formed by James river and Chapokes creek, and contains several thousand acres of land, distinctly marked from the very poor and high table lands, that lie immediately adjoining. The whole "neck" embraces not only the two estates of Upper and Lower Brandon, which alone will form the particular subject of this report, but also two smaller farms adjacent, of inferior soil, and to which no farther reference need be here made. Thus the name *Brandon* has several different applications, which should be borne in mind, to prevent confusion. The whole peninsula is called Brandon *Neck*. Brandon, simply, was the one estate formerly held by Benjamin Harrison, and which, after his decease, being divided between his two sons, George E. Harrison and William B. Harrison, the two separate properties are now known, the former as Lower Brandon and the latter as Upper Brandon. The terms lower and upper have no reference to the elevation of the surface, but merely to the relative position of the lands in regard to the river. These two estates are each divided into two separate farms; and

the four farms together take in much the greater and also the most fertile part of the whole peninsula.

The Brandon lands have the same features that distinguish all the *ancient* alluvial lands of James river in general. The surface is abundantly level, yet not entirely so any where; but gently undulating, so as to be almost every where quite free from the usual evil of rich low lands, excess of water, from which these lands would have been mostly free, even without any draining. But still there was much that required draining, and which, by that mode of improvement, has been rendered as dry as the higher part. The surface of the land is in the form of many low and long knolls or broad ridges, gently sinking at their sides and terminations, and separated from each other by shallow and narrow depressions. These depressions, for want of sufficient outlets, were originally ponds, covered with still and nearly stagnant collections of rain water, either during part or all of the year. But there was very little of spring water, or other than surface or rain water, to be removed, and of course the draining was easy and effective.

The soil in general is a reddish-brown loam, well known by the provincial term "mulatto land." The soil is deep, and the sub-soil so little different from the soil in general appearance, that it may well be supposed to have been of the same formation by deposite from the same originally overflowing waters. The texture of the soil varies, in different parts, from clay loam to very sandy and light loam. But, as all know who are acquainted with "mulatto soil," the stiffest is not too stiff and intractable for easy cultivation, or too close for the profitable growth of corn; and the most sandy, if properly constituted otherwise, is not too light and open for wheat or clover. The peculiar value of "mulatto land," and which value belongs to all the tracts named above as of ancient alluvial formation, must be owing to a happy combination of lime and oxide of iron, with the other ordinary ingredients of the soil. All these lands, like Brandon, were doubtless originally very rich; and though since greatly worn and exhausted, and reduced low in product, can be easily brought back, by judicious management, to a high state of fertility. There is no *carbonate* of lime in these soils, however, (which deficiency is almost universal in eastern Virginia,) but the lime in some other form of combination must be in sufficient quantity to give to the soil the power to combine with and retain putrescent manures —to produce clover to some extent and profit— and to receive benefit to clover from gypsum; neither of which three qualities belong to any of the naturally poor lands of the tide-water region of Virginia. On the other hand, there was not enough lime naturally, in the Brandon and other similar soils, to forbid the growth of sheep-sorrel, (*rumex acetocella*,) and poverty grass, (*aristida gracilis*,) when reduced to poverty, nor to prevent there being produced great and marked improvement when more lime is given to the soil. Indeed, it is almost exclusively on this kind of land that have been made the great improvements by liming, and by clover and gypsum in connexion with and after liming, on the lower James river. There is no reason, in the character of the soil, why the use of lime should have been so far almost confined to these lands. But there were two other reasons why the use should have been first commenced there, and the improvement prosecuted with more vigor than elsewhere. The first reason was, that these lands are altogether deprived of marl, which is so generally in abundance under the hilly or high and poor lands adjacent. In the second place, these fine lands were mostly held by wealthy and intelligent farmers, and such are more capable of appreciating proposed improvements, and more able and ready to execute them.

The former ponds, though having now been for a long time as dry and as regularly and as well cultivated as the originally dry intervals, are altogether of different soil. They are of a whitish gray clay, extremely intractable and difficult to pulverize and to keep in good tilth. Notwithstanding all the greater labor and more manure bestowed on these places, they are still easily distinguishable when ploughed, wherever seen, and exhibit a manifest difference in color, as well as inferiority in texture and in product.

For the foregoing general remarks, and for any errors therein, the reporter is solely responsible. In the following statements and details of facts, and the opinions expressed thereupon, he had the benefit of the careful and well weighed information of Mr. W. B. Harrison, the proprietor of the Upper Brandon estate, in answer to particular inquiries made in person, and in free conversation. The inquires were directed generally and more especially to the subjects indicated in the circular of the Board of Agriculture; and the answers of Mr. Harrison, in regard to the Lower Brandon estate, were all concurred in by his nephew, Mr. George Taylor, the administrator of the estate, who resides there, and the investigation was aided by his more particular acquaintance with the minute details.

Where the answers or statements are general, or not specially applied to any one locality, it will be intended to suit the two estates in general. When it is proper to distinguish between different parts, the distinction will be made. The statements will be arranged under separate and appropriate heads; but the consideration of some subjects will necessarily be somewhat intermingled with others; and therefore strict regard to method and general arrangement will sometimes be made to give way to convenience for description.

After a long course of exhausting and generally injudicious cultivation of the two Brandon estates, during the minority of these proprietors, the elder, George E. Harrison, whose lamented death occurred in 1839, came of age, and took charge of his share, Lower Brandon, in 1817, and William B. Harrison two years later. Both these gentlemen have been, from the outset, devoted, judicious and enlightened farmers; and on few estates, if any in Virginia, has there been more of valuable and productive improvement made, accompanied by securing of good and increasing annual profits. The untimely death of George E. Harrison did not, as is usual in such cases, put a stop to the then well advanced progress of improvement on his estate. His property was placed, and has since continued, under the general supervision and controlling advice of his younger brother; and the same mind and spirit, with equal zeal and energy, have since

animated and directed the whole procedure on both the estates. From their contiguity, their similarity of character and of management, the two estates, large as they are, may be properly and conveniently treated of as one subject, as will be done in this report. The elder brother had lost no time, and of course led the way in the work of improvement. His whole course of operations was judicious and admirable, and highly successful. Still he was cautious, and slow in some of the measures, especially in the main one, liming, compared to the later and better assured subsequent operations of his younger brother.

When the reporter recently looked over the Brandon estates, and with more care than on former occasions, for the purpose of preparing this report, there was one thing that frequently occurred to his observation. This was, that every particular operation was directed with a strict view to economy, so that it should yield the greatest possible profit; and as there are necessarily many more things to be done than can be effected, the most desirable and profitable are chosen to be executed, and are well performed, and the less profitable are entirely neglected. There seemed to be nothing done (of farming operations proper) merely for better appearance. Where the land was rich and well tilled, the crops heavy, and every thing essential thereto well attended to, there was necessarily to be seen, in perfection, the more prominent features of the beautiful as well as the useful of agriculture. But at the same time, the less important matters neglected, because something must be neglected, (but which a martinet farmer would have removed, though perhaps at greater loss than profit,) often caused apparent defects, which some persons might deem too great to be thus justified, and even approved, as parts of the whole management. Still, whatever of such deficiencies may there exist—showing that, as much as had been done towards perfection, much still was wanting—there was no reason to believe that the choice had not been judiciously made, both of the objects to be most cared for, and those to be attended to less, or not at all. Neater tillage may be seen elsewhere, in regard to the smaller accompaniments and finishing; and where there is less to do for the force employed, there may be fewer defects of omission in general. But, for so wide a field of operation, and for the means and force for operating, it may well be doubted whether there is any where a more profitable direction of effort than on Brandon.

Extent.—The estate belonging to Wm. B. Harrison is cultivated as two separate farms. Of these, Upper Brandon farm, (the residence of the proprietor,) has 780 acres of arable land, cultivated in turn; and no separate pasture, except Kennon's marsh, forming a point in the river of 1000 acres in extent, but of which only the margin joining with the high-land, is of any use for grazing. The great body, as of low marshes in general, is so miry as to be unsafe for cattle, and the rank cover, of sedge and other coarse water grasses, of no value for their food.

The other farm, Upper Quarter, has 650 acres of arable land, and 130 more of pasture. The pasture is of newly cleared land, and has been sown, and is partly set, in herds-grass. The only other use made of it is occasionally to sow parts successively in oats. 400 acres of wood-land are attached to the upper estate.

The estate of George E. Harrison, deceased, consists of the mansion house farm, called Lower Brandon, of 865 acres of arable land; and the Church Pastures farm, including Dandridges (purchased) 950 acres, and 30 acres of pasture land. A very large body of wood-land belongs to the lower estate—much more than is of any use. More distant, there is also a great deal of very poor forest land, which merely serves to supply building timber, and some part of the material for fencing.

Soil.—More than five-sixths of all the arable land of the two estates, taken together, is mulatto loam—varying in different parts from light to stiff loam. The sub-soil generally very similar to, but more clayey than, the soil above.

Rotation of crops.—On Lower Brandon and Church Pastures farms, the rotation is the same, of four fields; and the course of crops, on each field, is 1st year, corn, 2d, wheat, 3d, clover, and 4th, on more than half the field, wheat on clover fallow, and the remainder in clover and grazed. That part of the field of the fourth year which is not grazed, and the clover ploughed under for wheat, is selected so as to be the most convenient and suitable for the purpose.

Upper Brandon farm—in the four-field rotation of 1st, corn, 2d, wheat, 3d, clover, fallowed for 4th, wheat—except that a low and very light field of 100 acres (too light for good wheat) has heretofore been kept in a two-shift rotation, of 1st corn, 2 l, at rest; but is now put under a three-shift rotation, of 1st, corn, 2d, oats, and 3d, clover, not grazed.

The Upper Quarter farm, is cultivated in the three-field rotation, of 1st, corn, 2d, wheat, 3d, clover. No grazing on either farm or field of the upper estate, except on the recently reaped wheat fields and their young clover as soon as the wheat has been taken off to be thrashed; and the older clover fields late in the year after August, if to be ploughed for wheat; or September, and later, if for corn the next year. No grazing close permitted at any time.

Thus, on the four farms, there are four schemes of rotation differing more or less from each other; there being one kind for the two farms of the lower estate, two other kinds for the two farms of the upper estate, and one other kind for the light field of 100 acres attached to Upper Brandon farm. These differences have been prescribed in part by the difference of circumstances, and there being no separate pasture land on one of the two farms of the lower estate, and but 30 acres on the other; and on the upper estate the different courses were required by the difference of soil of the several farms. The Upper Quarter is more generally of light loam, better suited to corn than to wheat. The Upper Brandon farm, generally, more clayey and stiff than the other, and better soil for wheat than for corn; though the soils of both farms are no where so light or so stiff as not to be enough suitable for both wheat and corn. But, the low light field of 100 acres, though part of the Upper Brandon tract, is a very fine corn and oat soil, and nothing like equally suitable for wheat.

Preparation for and cultivation of corn.—The lands designed for the corn fields are in several different states, according to the different rotations.

On Lower Brandon and Church Pastures farms, part of the fields for corn is of clover of the third year, grazed, and part on wheat stubble. On Upper Brandon farm, it is wholly on wheat stubble, except on the light 100 acre field, which when for corn, and also the Upper Quarter shift, is in clover of the second year and best growth, grazed late only in the second year, and not so closely but that there is still a heavy cover of the remaining clover to be ploughed under.

Preparation for and cultivation of corn.—The land for corn, of either kind, is broken up with good three-horse (or mule) ploughs, cutting from 6 to 8 inches deep. This is begun in November, and each field usually finished early in winter. The dry parts of the field are ploughed flush, (or with a flat surface,) and wherever the least inclined to be wet, in ten-feet beds. The manure from the farm-yard and stables is carried out afterwards when convenient, and ploughed in with two-horse ploughs. During the spring, the lime is put out on part of the same field; and if it be a second application, it is put to the part manured. The balance of the land, not manured, is harrowed in the spring, and once harrowing generally serves to put the ground in good order.

The flushed part is laid off for planting in checks of 5 feet by 4½. The time in which the planting is desired to be commenced and completed is between the 5th and 25th of April. From 6 to 8, and even 10 grains of corn planted at each station. It is deemed economical to give so much excess of seed, to have the fewer missing places, and the less replanting. The corn at proper time is thinned to two stalks to the station.

The first ploughing, given soon after the corn is well up, is in the direction of the wider rows (5 feet) and with two-horse mould-board ploughs turning one furrow slice from each side of the corn-row. The next ploughing is across the preceding, and generally done with double-shovel ploughs, (two-horse,) going twice to the interval between each two corn rows, which breaks the whole interval. Mr. Harrison ascribes much benefit to his practice of giving early and frequent ploughings; and would prefer to repeat the ploughings as often as every 15 days, until the tillage be completed. He usually gives four ploughings (each time crossing the last,) with the double-shovel ploughs; the last of which is begun immediately after the wheat harvest is finished, and on the lightest and most forward land sometimes before harvest. The weeding with hand-hoes is commenced after the second ploughing. A second hand-hoe weeding is given to the foul spots only.

On the land thrown into ten-feet beds, there are two corn-rows planted on each bed 5 feet apart; and the first ploughing is given as above, by turning off one furrow from each side of each row. Next, the double-shovel ploughs are used to finish the interval which is on the top of the bed, (or including in it the crown of the ridge,) and one-horse turning ploughs to plough the water-furrow intervals, throwing the slices outward from the water-furrow. The hand-hoes follow, weeding the corn and putting a little earth to the plants. These operations are repeated as wanted, and four or five such ploughings are given in all. The blades (or leaves,) of the corn are pulled off and the tops cut, as usual for fodder; and no important injury to the grain is supposed to be thereby caused; care however is taken that the operation is at the proper time—not early enough (as supposed) to damage the corn, and not so late that the fodder has become much injured by decay.

Upon expressing surprise at so much tillage labor being used, in comparison with the usage of many other successful farmers, Mr. Harrison readily admitted the greater cost of his corn culture; but maintained that the additional labor was well paid for in additional product. He had tried the cheap modes of cultivation recommended. and had even succeeded in making what would have been admitted to be very good corn with less than half his number of ploughings, and without using hand-hoes at all for weeding. Nevertheless, he is sure that more work would have made a better crop, and that his now usual additional labor would have been well compensated.

Wheat.—The turning in of the clover (which has been neither grazed nor mown,) is commenced early in August, and sometimes late in July, forming fifteen-feet beds with four-horse ploughs, on the level surface; and with three-horse ploughs ploughing on ten-feet beds – *reversing* the latter, or making the crown of the new bed, by lapping the first slices, upon the former water-furrow, and making the new water-furrows under the places of the old crowns. The ploughing in both cases is from 6 to 8 inches deep, or as deep as the teams can well draw at that usually dry season, and turning under the fall growth of clover. Linked or coupled square harrows, which accommodate their cutting surface to the uneven and varying face of the ground, are passed over soon after the ploughs, to close the seams between the slices. The like harrowing is repeated occasionally afterwards, as required for the good condition of the fallow, and even the double-shovel ploughs are used on the most grassy spots.

The seed wheat is selected carefully, thrashed the earliest of the crop, and then put away dry. The sowing is commenced about the 8th of October. The seed is prepared by being poured slowly and gradually into a vessel of water, stirred, and all the floating grains, and all impurities light enough to float, are skimmed off. The wheat is then drained, sprinkled with and rolled in fresh slaked lime. This process is believed to be an effectual safeguard against the smut. The sowing is pushed on as fast as possible, beginning on the corn-land. The corn, on the stalk, is cut off at the ground, and set up in shocks, as usual, on the wheat, rows being kept sown a little in advance of the general seeding, to set the shocks upon. The corn-land is ploughed with two-horse ploughs, the wheat then sown, and harrowed in, by passing over the coupled harrows twice, or oftener if required. The usual quantity of seed to the acre is 1½ bushels, if of the purple straw wheat, and nearly two bushels if of the larger grained turkey wheat. On the clover fallow, rather more than 1½ bushels of purple straw is sown, or full 2 bushels of turkey wheat. The latter variety is preferred for cold or stiff soils—but the purple straw is better for all other soils, and in general. The latter has been sown at Brandon and preferred for the last 15 years.

On this subject, Mr. Harrison has expressed

his opinion more fully in a private letter, subsesequently received by the reporter, and which passage he will make free to quote here.

"In regard to seed wheat, not recollecting distinctly what my answers were, I would say that I greatly prefer the mountain purple straw to any other variety I have ever tried on our lands. It generally maintains its superiority here from seed time to harvest, over every other kind. There is less seed required, from the smallness of the grain, and I have observed that it generally comes up better than any other sort tried here. Although it grows very tall, my observation is that it stands better during its growth, and also in a protracted harvest, than any wheat known to me, and that there is less loss incurred in securing it. I do not doubt, however, the peculiar adaptation of particular wheats to particular soils; and on some of my own lands even, I prefer the culture of other kinds, and particularly when, from the tenacity and humidity of the soil, there is any danger of the smut. The turkey wheat is well suited to such places. Having said so much in favor of the purple straw, I must, on the other hand, admit that it is very subject to injury from the fly.

"With regard to continuing the same kind of wheat, from seed raised on the farm, without deterioration, I incline strongly to the opinion that it may be done by great care in selecting seed; which is a very important matter, and should be strictly attended to. It is said to be an excellent plan to select the earliest and finest heads, and to keep it pure in that way."

On the 15th of October, the sowing on the clover fallows is begun—believing that then commences the best and very limited time for sowing. It is important to get as much seed in the ground as possible in the next 10 or 12 days—and the facilities for much the most rapid operations are offered on the clover fallow. Double-shovel ploughs are there used to get in the seed, followed by harrows. The water-furrows are every where cleared out well by the passage of a suitable (double mould-board) plough, and cross furrows and grips (small, narrow and shallow ditches,) opened wherever needed in low places where the rain water would otherwise collect and stand in the water-furrows, to the injury of the crop.

Of late, the wheat seeding operations have been usually completed early in November; and immediately after they are done, the ploughs proceed to break up the land for the next crop of corn, which it is important to begin thus early, for the purpose of forwarding all the operations of the season. The great body of the field for corn is wholly ploughed before Christmas, or soon after. The land remains softer for being ploughed thus early, (turning under a good cover of wheat stubble or of clover in most cases,) and is the better to work during the whole of the following season of tillage, than if ploughed later in the winter. The particular attention to this important object of early ploughing, for the next crop, causes it to be late before all the corn of the crop then made is housed. No night work in shucking the corn is permitted. Most of the crop is put up at first in the shucks, and shucked afterwards, during rainy or other bad weather.

The corn for seed is selected carefully—and ought to be changed every few years. The same necessity for change exists as to wheat—though in changing seed, Mr. Harrison would still adhere to the same kind, the purple straw, for the great body of the crop.

Oats.—Not much of this crop made, and only for part of the horse-food. Contrary to the prevailing opinion, and judging from his experience, the growth of oats is supposed by Mr. Harrison to be not so exhausting to the land as that of wheat.

Clover.—The uses, and some of the after management of this very important crop, have been necessarily anticipated in the preceding statements, and under other heads.

The seed is sown between the 5th and 25th of February, on the wheat succeeding corn. It is preferred to complete the seeding on the wheat land, if possible, between the 15th and 25th of February. On the oat land, the clover seed is sown immediately after harrowing in the oats, and of course later than on the wheat land, according as the season may permit the oat seeding to be done. The quantity of clover seed given is a bushel to 10 acres. Some of the best grown clover of the first growth of the second year after sowing is mown for hay—and more would be so disposed of if it were convenient at that time to devote more labor to that object. No perceptible lessening of the succeeding wheat crop has ever been observed on the places from which the first crop of clover had been thus taken off. Except this small extent of mowing, and the partial and light grazing, within limited times, before stated, all the growth of clover is turned under by the plough, as manure, either in August and September for wheat, or in November and December or later for corn, according to the rotation of crops—the former being required for the four-shift and the latter by the three-shift courses. These remarks apply to the two farms of the upper estate. On the two farms of the lower estate, as before stated, the difference of rotation requires a practice somewhat different. There the clover is grazed close during its third year of growth on that half of the field which was not fallowed for wheat the previous year. The portion of the field thus grazed in the third year of the growth of clover, and the fourth year of the order of the rotation, as stated at its place, comes under corn the next succeeding year, together with the remainder of the field, which had been put in wheat. This course, on the Lower Brandon and Church Pastures farms, has been found more improving to the land than the thorough four-shift rotation of Upper Brandon farm; but both of them less improving than the three-shift rotation in use on the Upper Quarter farm—and this rotation, in suitable circumstances of soil, crops, &c., is preferred both for improvement of land and for annual products, to either of the other courses.

Mr. Harrison's general views of the comparative merits of the three and four-shift rotations, and with such change as longer experience had caused in his mind, have been presented at length in several communications to the Farmers' Register.* His practice, in making use of both rotations, especially when examined personally,

* See p. 464, vol. ii., and p. 241, vol. iii.

offers the best commentary on, and justification of his doctrines, in this respect. It should, however, be observed, that by using both these rotations on contiguous farms, he is enabled to obtain the peculiar benefits of each, and to avoid the peculiar disadvantages of both, better than if pursuing either one of these rotations only.

Product of crops.—The growth of wheat is subject to such great disasters, and the products of different years are therefore so variable, that even if the general average product of acres and of years were accurately stated of any particular farm, it would furnish but a very inadequate idea of the true average power for production. Thus, on a field, that under very favorable circumstances may have produced 20 bushels to the acre, in another year, of the preceding or succeeding course of crops, under an unusual (but by no means unprecedented) degree of infliction of Hessian fly, chinch-bug or rust, might yield only 2 bushels. The average of these two extremes, would be 11 bushels per acre; which, however correct as a statement of actual average product, would be altogether false and deceptious as an indication of the degree of fertility, or progress of improvement. For these obvious reasons, the reporter preferred to learn and to state precisely the *best* products of wheat on each farm, for entire crops, from which each reader may for himself estimate what may be expected on the average of seasons, or in the worst of years.

The best crop of wheat which has ever been raised on the Lower Brandon farm, was in 1838, the average of the whole being within a small fraction of 19 bushels per acre. Two thirds of the whole surface under wheat was corn-land of the previous year, and one third only was clover fallow. The best crop on the Church Pastures farm was the same year, and averaged 17¾ bushels to the acre. A general average of years and of land, on these two farms, under the rotation pursued then and since, *supposed* to be 13 or 14 bushels to the acre.

On Upper Brandon, the best crop of wheat, on all the land sown (in 1838,) was 24 bushels to the acre. The general average of seasons and of land for the whole farm, supposed to be about 15 bushels. On the Upper Quarter farm, (1838) 16 bushels average—and a general average of seasons and of land, for that farm supposed to be 12 or 13 bushels to the acre.

The reporter would here remark, that these best products are not of the best few acres, nor of even but part of a crop. They are of the full wheat crop of each farm, each including its full proportion of inferior land. As all these best crops happened to be made in the same year, on four different farms, under their respective regular modes of cultivation, and under three different schemes of rotation, it is manifest that the greater than usual product was owing to a peculiarly favorable season, and not to the superior fertility of the fields producing the best crops. Such a superiority of land may well affect the result of a single year's product on one farm only, and still more if not under a regular rotation with fields of something like equal productive value. But on four separate farms, all under their respective and regular and judiciously planned courses of crops, it would be next to impossible that there should be a general and considerable superiority of fertility found in all the fields, seven in number, in wheat in any one year, of the four farms. The reporter therefore infers that the large crops made in 1838, were not greater than may be produced in any other year of equally favorable season and other circumstances, on whatever other fields might happen to come under wheat.

All the best crops of corn were also made in one year, 1840. On Lower Brandon and Church Pastures, the crop made a general average of 7 barrels (35 bushels) of corn per acre. The general average of years, and crops of both farms *supposed* to be about 6 barrels. On Upper Brandon farm, the same year, the crops averaged in product 7 barrels, and on Upper Quarter, 8 barrrels per acre. The general average of years and crops for the former supposed to be 6 barrels, and of the latter, 6 to 7 barrels per acre.

No product of clover has ever been ascertained; but the usual growth of the best land is believed to be now, and of latter years, as heavy as on first-rate soils elsewhere, either in this country or in England. As was before observed, when speaking generally of such lands along James river, clover was raised here before liming and the other parts of the recent system of improvement had been in operation. But, (as Mr. Fielding Lewis also reported of his Weyanoke farm,*) there was no good and regular success except on the highest improved lots. Clover did not answer under general field-culture. In one of the communications to the Farmers' Register, before referred to, (p. 242, vol. iii.,) in 1835, Mr. Harrison, after having just stated that his main reliance for future improvement was placed on his expected clover crops, made the following incidental remark: "My best [clover] has certainly grown after lime and manure. *Indeed, without the previous use of lime, my clover hardly pays me for the seeding;* but in a few years we hope to have the whole arable surface here improved in that way, having already more than half accomplished it."

Liming.—This, the foundation of all other improvements on these farms, was first begun on Lower Brandon, in or about 1819, by its proprietor, George E. Harrison, who had then but lately arrived at age, and the possession of his property; but who displayed in this, as in other things, his excellent judgment as a farmer and an improver, almost from his earliest operations. The liming there was continued for some years thereafter, at what was then deemed a rapid rate, though very far exceeded since, there and elsewhere, when all early doubts of the large amount of profit had given place to perfect confidence. During those first years, the amount applied did not exceed the lime burnt from 200 hogsheads of oyster shells in any one year. Afterwards, the rate of progress was greatly increased. Before the death of the proprietor, nearly all the land of Lower Brandon and Church Pastures had been limed over once; and much of the same land has since received a second and lighter dressing. The second liming has been usually applied to the parts of the fields which had remained two years in clover, and preceding corn.

It was 11 or 12 years after the first liming on

* Report of the farming on Weyanoke, p. 17, vol. i., Farmers' Register.

Lower Brandon had been done, before William B. Harrison had commenced; but when induced to begin, by the example and success of his elder brother, and by the still older experience and more valuable lights and instruction of their old friend, Fielding Lewis, (to whom all concur in awarding the honor of being the pioneer and leader *par excellence* in this important agricultural improvement in Virginia,) the greater rapidity of progress on the Upper Brandon estate made amends for the late beginning. The liming was commenced in 1830, and both the farms had been completely limed, the first time, by 1838. The largest operation of any one year was 1900 hogsheads of oyster shells, bought, burnt, and applied. About one-fifth of the surface of both farms has been since re-limed.

The shells are brought from the oyster landings on the salt waters of James and York rivers, in vessels that make it a regular business, and are sold, on board the vessels, lying off the farmers' landings, at prices varying from 50 to 70 cents the hogshead, or 18 heaped bushels of shells. The purchaser has to take the shells from the vessel, with the assistance on board the vessel of the crew. The manner of burning and of distributing over the land pursued at Brandon is much the same as that of Mr. Lewis,* except that the kilns are put up with much less care and trouble—being merely heaps of wood and shells in alternate layers. In this manner, a cord of wood, or rather more, serves to burn 10 hogsheads of shells. By burning, (and before being slaked,) the shells are reduced in bulk about one third, or 100 bushels of shells measure out only 66 to 70 bushels. 72 bushels in this state, were put to the acre, of land ready ploughed for corn, by placing half a bushel to each check of 18 feet square. When air-slaked, and either by first covering over the heap with the surrounding earth, or without, the heaps are spread, and the land immediately harrowed, to divide and diffuse the lime properly, and mix it well with the surface soil. Mr. Harrison has made no estimate of the full cost of liming, in labor as well as money. His brother had estimated it at 10 cents the bushel, or, for such a dressing as the above at $7.20 the acre. And costly as this may seem, and alarming to the inexperienced, there is no farmer on the river who has limed to considerable extent, and in judicious manner, who does not regret (as a great and certain loss of profit in the omission,) that he did not encounter this expense earlier, or more rapidly than he did.

Mr. William B. Harrison re-limes at half the above rate, or 36 bushels to the acre; and he would now advise the putting no more than the latter quantity even for the first time of dressing, as he has seen injury produced by the too great quantity at once of 72 bushels. Decided and early beneficial effect he has always found to follow the first liming; and he has no doubt of benefit having also been produced by the second applications; but such would of course be less obvious, and has not always been observed. Mr. Harrison thinks liming to be the cheapest and best kind of manuring, counting both cost and returns. The gross products of the Brandon lands have been increased to double, since the occupancy by the two proprietors—and fully a third, in corn and wheat, since the liming. Of course, when gross products have been doubled on the same, or nearly the same amount of surface cultivated, the net products, or clear profits of farming, must have been increased in a far greater proportion.

Lime is the main source of improvement by other manuring, by its producing clover to be used as manure, and also by the farm-yard and other putrescent manures becoming much more operative on the land after lime has been applied. Of the latter important effect, no doubt is entertained. Before liming, clover was not so generally sown, and the crop often failed; and gypsum had on it but slight effect, and was not often used. There never had been a heavy field crop of clover in Brandon Neck, (though smaller spaces of the best land had sometimes produced very well,) until in 1835. Latterly and since liming, gypsum is regularly sown, at one bushel the acre, on clover, the spring (or second year) after sowing the clover. The effect is believed by Mr. Harrison to be always good and profitable on limed or originally good soil; but he is doubtful as to the unlimed, if originally poor, or even on land not of very good original quality.

The gypsum is sometimes bought ready ground, but more generally in the lump, and crushed at home, by a corn-crusher. The usual price, in the lump, is $5 the ton; but one cargo from Massachusetts was bought as low as $2.70. The ton measures 20 bushels or more when ground.

Live stock and putrescent manures.—The subject of prepared or putrescent manures cannot well be considered separately from that of the live-stock, which serve to produce so important a part of the value of these manures; and the management of the stock is a necessary introduction to the production and management of the manure.

Cattle.—There are about 75 head of cattle on each of the four farms. Their quality inferior, and their general order also, when seen by the reporter in April. The cattle on the lower estate are of better quality than on the upper. The keeping and treatment in winter are very good, so far as serve plenty of good long forage and litter, the offal of the large corn and wheat crops, and sufficient shelter from wet and cold. But this care, during all the season for keeping the cattle on dry food, does not compensate for the want of a sufficient and regular supply of good green food through the grass season. The restrictions on grazing the clover fields is one of the rules referred to before which operates admirably well for sustaining and fattening the land, but badly for fattening the cattle. The resources for the cattle, except when in the farm-yards on dry food, are the standing pasture already mentioned, furnished by the mere land margin of Kennons' Marsh for Upper Brandon farm, 130 acres of inferior land in standing pasture on Upper Quarter—and on both these farms, the grazing of the wheat field and young clover thereon for a short time after harvest, and the older clover late in the year, say in September and October. On the lower estate, also the half of one clover field on each farm, in the third year's growth of the clover, furnishes all the pasturage, except 30 acres of standing pasture on the Church Pastures farm.

* See p. 18, vol. i. Far. R. for more full description.

There being as few fences as possible (except the general outside enclosure) on both estates, there are none designed specially to separate the grazing land from the balance, and the cattle are restrained to their allotted space by being herded or guarded. This plan is however about being altered to some extent, and proper fences for the standing pastures were in the course of being constructed. This herding plan, though a great saving of fencing, and a great aid to the land, by preventing very close grazing any where, cannot be otherwise than bad for the cattle. They are harassed both by the attention and the neglect of the herd-boys—and are debarred from seeking and enjoying, at will, the full supplies of food, water, rest, and shade, that they need. Even if enjoying all these to the fullest extent for a week, the neglect or ill treatment and privation of a single day may undo all the benefit received during the week of proper indulgence. Under this plan, a stock of cattle can scarcely do well. And of these evils the reporter may presume to speak thus, as he has long pursued this same plan of herding, to save the expense of fencing—and he knows well its particular disadvantages to stock, as well as the benefit to the land and to its product. He still deems the balance of advantages greatly in favor of this plan, and it is still pursued on the farm in which he has a share, except so far as having a small enclosed standing pasture.

It is therefore by no means designed as a subject of censure, in the general, when stating the objections which apply particularly to the cattle and grazing management on the Brandon estates. The making of manure is the great object there sought and gained by the keeping of cattle; and except this, there is very little of other benefit, except that of furnishing plentiful supplies of milk, butter and meat, to the families of the proprietors, and the breeding and raising oxen for labor. There are no sales of products of stock, except about 100 lbs. of butter from the upper estate, and 150 lbs. from the lower, and some few veals from both, annually.

Horses, and stable management.—On each farm, it is made the regular business of a suitable hand to clean out and then litter the stable, and chop up the long forage, (corn-fodder or clover hay,) with a straw-cutter, and have the proper supply ready in the trough of each horse, when brought in from work, so as to save time. The allowance of corn is 5 large ears to a mule at each feed, three times a day. To large horses and unthrifty animals, more corn is given. Of the long forage, there is always an abundant supply on hand, and it is given freely, chopped as above stated. And were this allowance less abundant, more corn would be necessary.

The corn is sometimes crushed in the ear, for horse-feed, and it is highly approved. The practice was introduced on Lower Brandon by its late proprietor, and has been continued since. It is not supposed that there is any great saving in the allowance of grain—but the animals seem to thrive better, and require less long forage.

The stables are fully littered at all times. In cold weather, the litter and excrements are suffered to accumulate for ten days or even two weeks as may be most convenient. But in warm weather, Mr. Harrison deems it necessary that the stables should be cleaned out every day. For the quality of the manure, if that alone were considered, he would prefer that it should be suffered to accumulate in the stables; but the main point, whether the stables be cleared out every day or more seldom, is that plenty of litter shall be used. The fire-fanging of the manure (which is the result of too high fermentation, and too little moisture,) is especially guarded against.

There are about 120 sheep (exclusive of lambs) on the upper estate, and 140 on the lower. The sheep are herded as the cattle are, and always penned at night, and they add considerably to the amount of manure. They are fed in winter on turnips, top-fodder, &c.

There are enough hogs raised and kept on Lower Brandon and Church Pastures to furnish for slaughter annually from 70 to 80 at each farm. The hogs have a good woods range, outside of the enclosure. 58 hogs were kept up in pens throughout last year, for experiment, until killed; and the result was so favorable, that the course is continued there, and has been also commenced on the upper estate. The hogs so confined were fatter when killed, and weighed more for their appearance then the other ranging hogs. At Upper Brandon, the hog management has been very unsuccessful. Not more than about 70 hogs are killed for bacon each year. It is necessary on the lower estate every year to buy much more pork for the farm supply, besides all that is raised; and there is a still greater deficiency to supply on Upper Brandon.

The cattle are kept in the winter farm-yard through the day as well as night; and until late in the spring—sometimes until the 10th of May. The sheep, during winter, are let out of the pen to graze in the day, when convenient.

Every portion of the offal of the grain crop, (corn-stalks and wheat straw,) not required for food, is used as litter, and converted to manure. There are no other sources of supplies of litter. The wood-land is so distant that the leaves are not deemed worth being brought to the farm-yard, and there are no wet natural meadows used for mowing. All the manure made before the 10th of March, is carried out on the field for corn, (already ploughed early in winter,) and spread and ploughed under before planting the corn. When very coarse, the manure is heaped in the spring and heated a little, to somewhat rot and reduce the coarser parts. The stable manure is sometimes mixed with the poorer manure of the cattle yard, to forward the rotting. The manure made in the cattle yard after March the 10th, is suffered to remain there, and is used the next spring. This delay is deemed advantageous, as such manure is very coarse. Top-dressing on clover, for which such coarse stuff is well suited, and can be cheaply so applied, has not been yet tried by Mr. Harrison; but he will do so. From the farm-yards and stables, there were manured for this crop, (part of the late made manure of last spring, applied in autumn for wheat on clover fallow, but principally for recent manure, to corn this spring,) more than 60 acres on Upper Brandon, and more than 40 on Upper Quarter—a good heavy covering, supposed to be about 60 two-horse cart loads per acre; besides the land manured by summer cow-pens, (without litter as usual,) and which would amount to 7 or 8 acres for each farm. On Lower Brandon

and Church Pastures, about 70 acres manured on each, of farm-pen and stable manure at the above rate, besides the summer cow-pens.

Distemper of cattle.—The mysterious and deadly disease of cattle called "distemper," prevailed to such an extent in or about 1830, that 54 head of cattle, died with it on the estate in one season. The cattle that died were in good order —which is one of the peculiarities of this disease, the fat animals being more apt to be infected than the poor. Since then, cases have only occasionally occurred. Mr. Harrison thinks that the mixture of tar, sulphur and salt, kept always in the pens during summer, and which the cattle will lick, has been the preventive against this terrible disease. He was advised to use this remedy by Mr. Fielding Lewis, who, as usual, was resorted to as the best source from whence to obtain information and judicious advice. When recommending the use of this medicine, Mr. Lewis stated that, before using it himself, he had formerly lost some few cattle almost every year; but since keeping it regularly in the cattle pens, he had never lost one of his stock by distemper, except a bull, which, by being confined separately, was debarred from access to the mixture.

Laboring force of teams and hands.—On the two farms of the lower estate, there are 38 to 40 horses and mules for the plough and other farm labor, and about 48 oxen. On Upper Brandon there are 18 working horses and mules, and 15 on Upper Quarter, and about 48 oxen on both these farms also. The small oxen raised here are more hardy, and bear labor with less fatigue, than the much larger oxen of the upper country.

On both farms of Lower Brandon, there are 70 field hands of all ages and kinds. There are also 6 other men, who are carpenters, sawyers, and black-smiths. There is also a saw-mill there to provide timber and plank for the buildings and other constructions of the estate. On the two farms of the upper estate, there are 60 field hands, besides 8 mechancis, who are not employed in field labor. No domestic servants are included, nor has any reference heretofore been made to any thing of either labor or expenditure except matters appertaining to the farming operations. The splendid mansion houses and beautiful gardens and ornamental grounds, of both the estates, and every thing connected therewith, however admirable or delightful, are not proper subjects for farm reports.

Agricultural implements and machines.—The ploughs used for turning in clover to sow wheat, are the four-horse and three-horse McCormick ploughs. Two-horse ploughs, of same pattern, are used for ploughing the corn land for wheat. For breaking up land for corn, the three-horse ploughs are used. All there are made by William Palmer of Richmond.

For tillage of corn or other horse-hoed crops, on flushed land, the two-horse double-shovel-ploughs are used and preferred to all others. Single-horse turning ploughs, used for the water-furrow row (or interval) of bedded corn-land. No cultivators used. At Lower Brandon, the X plough, a kind of cultivator, is sometimes used for covering seed-wheat and oats. But if the land be in good order, the linked harrows are used for that purpose. Mr. Harrison has heavier harrows, but prefers the lighter linked harrows.

A marker is used to mark off rows to plant corn. It is like a horse-rake, except that instead of the many rake-teeth, there are 3 small iron hoes, so formed and set as to make a plain but shallow mark, as the implement is drawn across the ploughed land. One of the out-side hoes runs in the last marked row, (if on level ploughed land) and the two other teeth mark new rows. This simple implement, which the reporter saw here, and adopted its use, with some modification, long ago, offers a great saving of labor over the general mode of laying off rows, by setting up poles to direct the course of the plough.

There is at Lower Brandon a good horse machine to gather clover seed, by combing off the ripe heads, but too costly. At Upper Brandon there is a rough and simple one, such as can be constructed by any farm carpenter—and which will serve the purpose well enough.

Hussey's reaping machine was here first tried last harvest and approved, (See F. R., vol. ix. p. 434,) and it will be hereafter used for part of the reaping, unless superseded by a better.

Parker's thrashing machine, for 8 horses, is used. It has not yet thrashed out but from 300 to 400 bushels of wheat a day. But if properly fixed, and properly supplied and worked, it is thought that it might thrash 700 or 800 bushels in a day.

The straw-cutters used are Parker's.

A corn sheller, worked by 4 horses is used—and shells from 250 to 300 barrels of corn a day.

A mill which was designed by its constructor to crush and grind ears of corn for home food, is used to crush and grind lump gypsum, for manure. It will grind 40 bushels a day, with two horses, but is heavy labor.

The hand utensils are not different from those used on most other farms.

THE TIMES OF THE RIPENING OF WHEAT IN DIFFERENT PLACES.

For the Farmers' Register.

It is desirable to know the period of harvest in the different parts of the United States, and I am not informed of any tables of comparative seasons that have been published.

There is an interval of many weeks between its commencement in the southern and northern portions of our wheat growing country. The harvest begins two months or more earlier in the southern counties of England than in Scotland. The interval may not be so great here, on account of the heat of our summers even in the northern states, but yet it is so considerable that the season may operate very differently on the crops at distant points of the union.

If the editors of the several agricultural papers would make notes of the time of beginning to cut wheat in their respective vicinities it would be both interesting and useful. It would enable us to make a calculation of the effect of the weather on the crops on an extended scale, and a more general estimate might be made of the harvest than when the farmer's knowledge is confined to his own neighborhood. We should also know when to expect that the new crop from different parts of the country would be received in the market.

In the south the weather may be favorable, when heavy rains occurring after our harvest may injure the northern crop: and on the other hand rains destructive with us, may be too early to cause any damage to the north. Wet weather about the 15th June would be seriously injurious in this latitude. Five hundred miles north of us the same weather might be beneficial.

I have known incessant and great rains up to the 10th June, succeeded by fine crops of wheat.

The rains within the ten days immediately preceding harvest are the most injurious.

Sometimes a promising crop is within a few hours of being ready for the scythe, when the rust spreads over the whole of it, diminishing the product by one-half or even more.

From this uncertainty of our climate, no calculation can be made of the wheat crop till we are fairly engaged in harvest.

The following is an extract from a memorandum kept for the last fourteen years, twenty miles north of Richmond.

1828. Began to cut wheat on 9th June. Early or May wheat.

1829. June 22d, late wheat.

1830. June 15th, with a few reapers, with all hands on the 18th.

1831. June 20th, do. do. 21st.

1832. June 23d.

1833. June 14th with a few reapers, with all hands on the 17th.

1834. June 20th, do. do. 23d.

1835. June 26th.

1836. June 28th.

1837. June 24th with a few reapers, with all hands on the 26th.

1838. June 25th.

1839. June 19th with a few reapers, with all hands on the 21st.

1840. June 12th. do. do. 15th.

1841. June 23d.

The crop every year after 1828, was exclusively of late wheat, as purple straw, turkey wheat or lawler wheat. The May wheats are generally ten days earlier than the late. The extremes of the time of beginning harvest, (excepting the May wheat in 1828,) are in 1840 the 12th June, and 1836 the 28th, making an interval of sixteen days. The crop of 1840 was not a good one, that of 1836 was wretched, and in this year there was a general failure throughout the United States. The crops of 1832 and 1838 were the best of the series. We usually count on finishing harvest by the 4th July.

I hope other agricultural papers will furnish similar statements, and if none of their correspondents can go so far back, let us have at least the dates of the harvest for the present year.

Your readers would be pleased to know particularly when the harvest begins in North Carolina, Maryland, Pennsylvania, New York, Michigan, Ohio and Missouri. W.

May 29th, 1842.

We ask attention to this suggestion, and aid to the proposed measure. We will furnish our mite of practical experience thereto, very soon. —Ed. F. R.

ADDRESS BEFORE THE CAYUGA COUNTY AGRICULTURAL SOCIETY, AT AUBURN, N. Y., FEBRUARY 1, 1842.

By David Thomas.

Geologists inform us that soils were chiefly derived from the wear and tear—the disintegration and decomposition of solid rocks. In some tracts of country, the soil is nearly identical with the rock that immediately underlays it, or partakes largely of its nature; but such occurrences are rare in this county. So extremely active was the deluge that swept over and rounded our highest hills, that many a square league of stony strata was entirely buried by materials that drifted from other parts of the country, and which have no resemblance to the rocks they cover.

Favorably for the southern parts of our county, that deluge came from the north, sweeping over a limestone region, and depositing, in its course over our barren state, the rich collection it had made. And here let us stop to consider: if that flood had come in an opposite direction, bringing along the unproductive detritus of the mountains, instead of our fertile fields, and flocks and herds, we might have witnessed nothing more inviting than scrub oak plains, and a few wandering deer.

Like other floods, however, its deposites were irregular, as its velocity was increased or retarded—as it whirled into eddies, or rushed onward in its course. Pure clay, indeed, can scarcely be found in this formation; but all the varieties of loam, whether clayey, sandy or gravelly, occur; and some deep beds of both sand and gravel, are so pure as not to discolor the water into which they are thrown.

Such instances however are rare; and the grinding and mixing of so many instances by that deluge, have been eminently beneficial to our farms. No soil is fertile, says Humphry Davy, "that contains as much as 19 parts out of 20, of any one material or constituent." On the contrary, soils that contain mixtures of many things, are generally very fertile,—provided that clay, lime, and sand, form a large share of the mass. When you see, therefore, old mortar, the sweepings of the smith shop, or leached ashes thrown into the highway, you may safely conclude that the owner is greatly in want of instruction. These are excellent manures, and permanent in their effects.

Perhaps some would ask, why are different things necessary to constitute a fertile soil? Allow me to answer in the language of Dr. Jackson's Geological Report on Rhode Island; "Chemical science arranges all bodies as electro-positive, or electro-negative. The electro-positive are always the alkaline or basic substances, while the acids are always electro-negative when brought in contact with matters of the positive class. If a soil is wholly positive or negative in its nature, it fails to be fertile; and when one power greatly predominates over the other, it is not in its most favored condition. Silex is regarded as an acid, and alumina, lime, magnesia, iron, and the alkalies, are its opposites."

According to this view, the soil may be considered as a vast galvanic battery. "It is ren-

dered nearly certain," says an eminent writer, "that manures act by the salts they contain, acting when brought in contact with the earths in producing galvanic currents," and of course stimulating the plants in their growth. On this subject, however, I give no opinion of my own, because I can comprehend much more clearly, the neutralizing effects of acids and alkalies, and the absorbent powers of the different materials. This view may regulate our practice quite as well as the former; and indeed there seems to be nothing discordant between them.

It is not many years since the existence of acid soils was denied, or overlooked. The editor of the Farmers' Register, in Virginia, was the first to point out the error or oversight; and the subject is now better understood. He furnished no evidence indeed of the presence of uncombined acid; but the circumstantial evidence was very strong and pointed; and in my judgment he fairly made out his case. Since the publication of his "Essay on Calcareous Manures," other writers of great respectability have either adopted his views, or furnished additional and positive proofs of their correctness.

The question may occur, why is not an acid soil as fertile as any other? It is more fertile than any other for such plants as the red sorrel; but not for the plants which are the chief object of the farmer's culture. These generally require a neutral soil—that is, one in which lime, under some form or other, occurs in considerable quantity.

Although clay, according to Dr. Jackson's classification, is arranged as an alkaline earth, yet, as such, it is so feeble, that when united with *silica* or sand alone, the mass becomes acid, and unfitted for our usual crops. On such lands, Indian corn assumes a yellow sickly aspect, even when it is not injured by stagnant water. And what is the cure? Apply lime enough, and then, says an accurate observer, "the young corn takes immediately a deep, healthy color, before there is any perceptible difference in size. The crop will produce from fifty to one hundred per cent more the first year, before its supply of food can have possibly been increased.* And why? Because the poison which has paralyzed it, was destroyed.

It is well known that when magnesia occurs among quick-lime, it is often injurious to the land. Such a mixture is called *hot lime*, from its burning alkaline quality,—the magnesia not combining so speedily as lime does, with carbonic acid, which would render it mild. Besides, the lime, having a stronger attraction for that acid, will either be served first, or take it from the magnesia till it has got enough. I have seen spots of earth, where large heaps had been thrown down to slack, remain barren—as free from vegetation as this floor—for two or three years, although the ground had been carefully scraped over when the heap was removed.

Yet such is the stuff to which the south-eastern part of Pennsylvania owes much of its fertility. Formerly, when I lent a hand to that process, it was considered that 30 or 40 bushels to the acre were as much as the land could bear without injury. It was found, however, that rich land would bear more than poor land; and in process of time they discovered that 100 bushels to the acre might be safely and profitably applied to pastures, or meadows. The lime was slacked in large heaps; and then from a cart or wagon, on a calm day, it was scattered with a shovel evenly over the grass. It fell among the decaying leaves, which in warm weather yield carbonic acid, and it became mild without injuring the crop.

Some years ago, I published an account of this simple method, believing it superior to that of any other country, and you may judge of my surprise to see it stated in a work of high authority, bearing the date of 1840, that magnesian limestone is unfit for the purposes of agriculture!

Lime, however, possesses other properties besides that of neutralizing acids. One of the most remarkable is the power to absorb putrescent manures; and to hold the fertilizing essence till it is wanted by the crop, through every vicissitude of the seasons, and through indefinite periods of time. There it is, locked up; and nothing at common temperatures, but the energy of a growing plant, can unlock it.*

Lime has therefore been styled the basis of all good husbandry. It stores up the manure that is not immediately wanted, for future use—a kind of *save-all*. When the supplies from the barn yard are spread and ploughed into a soil that is nearly destitute of lime, the growing crop catches a part of its virtue; but a very large part escapes, and very little will be left for the benefit of those that succeed. I had been used to such soils until I removed to my present farm; and was then agreeably surprised to see how much more durable were the effects of stable manure. My fields were limed by the deluge.

Unwholesome vapors and villanous smells are also absorbed by lime; and some places, once remarkable for insalubrity, have been changed in their character by liming or marling the fields around them. Nuisances are converted into manures. A striking illustration of this principle is contained in the following account from the Essay on Calcareous Manures.

The carcass of a cow, killed by accident late in the spring, was laid on the ground, and covered by about 25 bushels of broken shells mixed with 45 bushels of earth chiefly silicious. After the rains had settled the heap, it was only six inches thick over the highest part of the carcass. The process of putrefaction was so slow, that several weeks passed before it was over; nor was it ever so violent as to throw off any effluvia that the calcareous earth did not *intercept in its escape*, so that no offensive smell was ever perceived. In October the whole heap was carried out and applied to one sixth of an acre of wheat; and the effect produced far exceeded that of the calcareous

* Essay on Calcareous Manures.

* The following extract from Liebig's Organic Chemistry, is cited as a parallel case:

"An abnormal production of certain component parts of plants, presupposes a power and capability of assimilation, to which *the most powerful chemical action* cannot be compared. The best idea of it may be formed by considering that *it surpasses the power of the strongest galvanic battery*, with which we are *not* able to separate the oxygen from carbonic acid." p. 184.

manure alone, which was applied at the same time on the surrounding land.

The same valuable work contains a caution to the farmer which may save him from a dangerous error. "He is not to suppose that calcareous earth can enrich a soil by direct means. It destroys the worst foe of productiveness, [acidity] and uses to the greatest advantage the fertilizing powers of other manures; but of itself it gives no fertility to soils, nor furnishes the least food to growing plants." In other words, it is the strong box for the treasure, but not the treasure itself.

Lime also possesses the property of making sandy soils closer and firmer, and clayey soils lighter. It is a mean between two extremes.

I was conversing several years ago, with a farmer from a sandstone district, who expressed some surprise that 40 bushels of wheat could be raised to the acre. "I don't believe," said he. "that our land could be made rich enough to produce such a crop—it would lodge." I am entirely of the same opinion, unless lime be employed. Stable manure is too stimulating—the stem grows too rapidly—it is succulent and weak. Whether the lime by combining with silica assists in stiffening the stalk, or not, we may be certain at least, that it yields nourishment as the plant needs it; and that every part will be healthy and properly developed.

Professor Emmons says in one of his Geological Reports, that the most fertile soil formed artificially, by the mixture of different earths, yielded on analysis 37 per cent. of carbonate of lime. As it is known, however, that lime in some soils soon ceases to be a carbonate,* it is probable that the real quantity of lime was even greater than what was indicated by the analysis. I have seen soils of remarkable fertility, that naturally contained a very large proportion of lime; and there is no danger of having too much when it is properly applied.

In drought, how are plants supplied with water? After a shower, the soil may be wet enough for a time; but when the sun and wind dry the surface, the moisture rises up from below by capillary attraction, as the melted tallow rises up through the wick of a candle to supply the deficiency above. It is from this circumstance that our crops over deep beds of sand suffer less in dry weather than where the subsoil is hard and impermeable—showing the benefit of deep and thorough ploughing. In either case, however, as the supply begins to fail, and the soil grows drier, its finest parts absorb moisture from the air; and the plants are constantly nourished by this invisible fountain.

But the different constituent parts of the soil act with different degrees of energy.† Of the earths, the silicious is the weakest,‡ and the aluminous the strongest, while lime holds an intermediate position. Not one of these however would do by itself. We want sand, because no soil consisting entirely of impalpable matters is fertile;* and we want it to keep the soil loose, so that the air can enter its pores, and give up the water which it holds as vapor.—Without such assistance, stiff clay or aluminous earth would absorb but little moisture from the atmosphere, because it cakes, and shuts out the air. Lime is also a valuable auxiliary in rendering the soil more absorbent, independent of its other indispensable qualities.

But the soil, however it may be tempered and constituted, can never be absorbent in a high degree without culture. Some crops indeed require more of this quality than others. Thus Indian corn requires more than wheat; and wheat more than the grasses of the meadow. But vegetable and animal matters are more absorbent than the earths; and culture only can properly introduce them into the soil. Even when there, frequent stirring is necessary to keep the ground loose and the pores open, for the free admission of the air and the easy passage of the roots.

Our coats sometimes become spotted with mud. We apply the brush, but the bristles pass over without effecting its removal. What is the reason? The clay which was suspended in the water, forms a glaze or crust. It is just so with the interior of a soil which has laid long unstirred. The clay forms a crust round the inside of all the little cavities, preventing the free circulation of air, and the introduction of moist vapor. The fertilizing principles are excluded.

The celebrated Tull, observing the extraordinary effects of high culture, concluded that plants fed on mellow earth, and Duhamel adopted the same notion. Their philosophy was *coarse*, but their practice was *fine*. If we were to follow their example, making plenty of fine earth for the plants—not to *feed on*, but to *drink from*, our crops might be greatly increased. One of the chief errors of our husbandry is to cultivate too much land, because it is only half done. Half the quantity with double the work on it, and double crops would be found more profitable.

I have long believed, however, that no part of the system required reformation more than our management of manures. Manure has been called the wealth of the farmer. When it is taken out in the spring, it is commonly scattered over the ground in large lumps; the plough comes along and covers them, or not, as the case may be. If covered, they intercept the ascent of the moisture from below, especially in dry seasons. If not covered, they lie wasting on the ground—of very little value. Indeed some excellent farmers have satisfied themselves that strawy manure is unprofitable for summer crops.

I am far from holding that opinion, however. The error consists in not applying it to the soil in the best manner. In the spring of 1840, I had no ground for field beets, but a small lot where corn had grown for two years in succession. It was unfit for such a crop without manure; and I had only fresh manure from the stable, which has long been considered most unfavorable to the beet. My necessity, however, prevailed against opinion; and I took the responsibility. From each line where the beets

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* Essay on Calcareous Manures.

† Davy's Agricultural Chemistry.

‡ "Sand gives little absorbent power.'—*Agric. Chemistry.* "Sand is incapable of absorbing moisture from the atmosphere, or of retaining any valuable vapor or fluid."—*Essay on Calcareous Manures.*

* Agr. Chem.

were to grow, two furrows were turned so as to leave a wide dead furrow. Into this the manure was thrown from the wagon, each forkful touching the one just behind it, till the row was completed. It was well covered by turning two furrows together over it, which *held it down* while the harrow was passing four times in succession, breaking, pulverizing, and mixing it intimately with the soil. Again two furrows were turned together over the row, and the harrow passed twice more—in all, six times. By this process the ground was reduced to a fine tilth; and if there were any better beets in the county, I did not see them.

To me, it was a most instructive experiment. I have often seen manure applied to corn fields, but never in any case where it was so completely incorporated with fine earth. Even in the driest part of that season, the ground was always moist and mellow.

I am satisfied that we have been too saving of our harrows. Thirty years ago, there was a method of ploughing in this country called '*cut and cover.*" It was ploughing, not to the *shares*, but the *halves*—the furrow slice covering the space where a furrow ought to have been. I am apprehensive that our ideas of harrowing were learned in the same school. When grain is sown, is it not the prevailing opinion that it is harrowed enough when the seed is covered? I had a narrow land harrowed sixteen times in one day, and was satisfied that the labor was well applied.

For beets, or corn, or potatoes, what would be the effect of ploughing in a heavy dressing of stable manure, harrowing twice, and repeating the operations of the ploughing and harrowing four times more, adding each time to the depth of the soil? I have not yet performed the experiment, but the nearer I have approached it the finer has been the crop. Thorough culture would seem to require that every little lump should be broken, so that the roots could wander freely in every direction, and that every drop, of a summer shower, should be caught and retained for future use. Hard land and thin soils have some resemblance to a dish bottom upwards.

An instrument for pulverizing the soil was invented a few years ago in Virginia, by Thomas B. Gay. It is called the drag-roller, for it operates just as a roller would that does not *turn*, but *drag*. Take a hollow log, six or seven feet long, split it in two, and one half would serve for this instrument. The greater the diameter, the easier it would run; and be less liable to clog by gathering clods before it. Three feet would be better than two, though either would answer. Frame two pieces of scantling into it, connecting them in front; and to this fixture the team is to be attached.

Do you believe that clods as big as a man's fist, or as big as his head, are more useful to the crop than stones of the same size? I do not. But if we can break them—grind them to dust—and leave them on the land, they would do as much good as other mellow earth of the same bulk. Now in warring against the clods, this instrument is formidable; and most so before they become thoroughly dried. On the same day therefore that the plough turns them *up*, let the drag-roller grind them *down*; and let me suggest that lumps of barn yard manure would escape not much better.

Stable manure, however, is often saved for the wheat field; and at any time during the summer, either before or after harvest, it is taken out and thrown into heaps, where it lies wasting until seed time. It is then thrown round into large lumps as before mentioned, the plough covering some, while others too big to cover stick up over the field. If the wheat is harrowed, perhaps some of these pyramids are upset or demolished; but often the harrow serves them as the plough did—gives them a shove and passes on. Now it seems very clear to me that manure applied in this way is comparatively of little value.

There is another class of farmers who manage things differently. Soon after the warm weather commences in spring, they collect all the manure of the barn yard into large heaps; and work it over, two or three times in the course of the summer, so that the straw may moulder and be more easily mixed with the soil. This advantage—the only one that I can discover, is indeed secured, but at a heavy expense. The best part of the manure passes off to visit their neighbors, or roam at large through the atmosphere, leaving the worst part, though still of some value, for the owners. The praise of industry is theirs, and the reward of working for nothing and finding themselves.

Another set of farmers, more interprising still, make up all their barn yard manure into compost. This is done by successive layers of manure, rich earth, and lime, together with any refuse stuff, animal or vegetable, that may be at hand—to be turned and mixed several times in the course of the season. Such manure is always valuable; but with a little more knowledge, its value might be much increased.

Let us consider this subject. From a heap of fermenting manure, a vapor continually rises, very different from the exhalation of a pond, as our noses might testify. Perhaps some may think that such thin diet as that would be of no consequence to a plant; but I can assure them it is the best part of the manure. Humphry Davy filled a three-pint vessel with a bent neck, from a fermenting heap of stable manure while it was hot, and turned the beak among the roots of some grass. Nothing but vapor left the vessel; yet in less than a week the grass grew with much more luxuriance than the grass in any other part of the garden.*

The value of this vapor is therefore evident; but how shall we save it? In the first place, the fermentation should be very gradual. Make the heap in the shade, or on the north side of a building, and manage it just as you would manage a coal-kiln. The more the air is excluded the slower and better will be the process. Now covering it with earth will have this effect; but vapor will rise even when it ferments slowly, and therefore marl may be freely scattered through the heap as it is made; but no quicklime. Lime, indeed, should form an outside covering for the whole pile (when marl is not at hand); but it should be carefully prevented from coming in contact with stable manure, or any

* Davy's Agricultural Chemistry.

animal matter. It must not touch them. It spoils them. A layer of earth should be interposed; and then the lime would be highly useful in catching and retaining the fertilizing vapor as it rises.

I believe there is no difference of opinion on this subject among chemists. Humphry Davy speaks in the plainest language against mixing quick-lime with common dung as injurious; and other eminent men fully accord with the doctrine. On the outside of the heap, however, quick-lime in a few weeks would be carbonated; and after undergoing this change, it might be safely mixed with the compost. A fresh coat may then be applied.

But some farmers may not wish to apply their barn yard manure in the spring, or make it into compost—they may prefer using it after harvest, and yet not have it wasting in the mean time. In that case I would advise that it be thrown inward where it lies thin, just so far that this work conjointly with the work of covering it, shall amount to the least labor. Then cover the whole with straw or earth to protect it from the sun; and cause it to be trodden down by the cattle as firmly as possible to exclude the air, and prevent fermentation. Some of you may recollect when forking up such matters after harvest, that the straw in spots was bright and unchanged. That was where it was well trodden. All change is attended with loss; but as some change may be expected strew lime or marl and plaster plentifully over it, to absorb, or arrest the fertilizing vapor.

The effect of plaster (composed of lime and sulphuric acid) has long been a source of wonder; for it was a wonder how one bushel could add more than 20 times its own weight to a crop of clover. Inquiring minds of course have been busy in trying to explain the mystery; but I doubt if all the properties of this manure are understood even at this day. Humphry Davy was inclined to think that plaster was a necessary part of the woody fibre of some plants, analogous to the bony matter in animal structures. The plant could not do without it, though it wanted but little; and hence so small a quantity had such a powerful effect. "Plants which seem most benefited by its application," says that eminent chemist, "always afford it on analysis."

When this theory was announced some thirty years ago, it was rejected in this country, where the effects of plaster were much better known than in England, but if he could have shown that it enters into such plants in any definite proportion, some of the arguments against him might have been refuted. It appears, however, that he never pursued the inquiry with much interest.

Judge Peters of Pennsylvania had done more than any other person to extend the knowledge of this manure, and to favor its introduction. He had been very diligent and minute in his inquiries; and though not a professed chemist, became satisfied that sulphuric acid was the active ingredient in plaster. He showed, from the observations of Berard, that lands near Catanea in Sicily, abounding in volcanic matter, including sulphur,* were very fertile; and from an experiment by the same person, that brimstone, pounded, sifted and mixed with ashes, had a surprising effect on lucerne and clover. Sulphuric acid greatly diluted with water, had a similar effect.

As a further confirmation of the effects of sulphur or sulphuric acid, when Chancellor Livingston was travelling in Flanders he saw the farmers preparing pyrites for manure. This mineral is a combination of sulphur and iron, and when partially burnt is employed in the same manner, and for the same purpose as we use plaster. Dr. Chapman of Pennsylvania found a similar result from sulphuret of barytes.

Last summer, a new work called, Organic Chemistry, by Professor Liebig of Germany, was first published in this country; and it has been considered by those best qualified to judge, as constituting a new era in agriculture. It is not my intention, however, to detain you with any of its details, except his explanation of the effect of plaster on growing plants.

Ammonia is an essential part of the food of plants. It affords all vegetables, without exception, with the nitrogen that enters into their composition. It is very volatile; but sulphuric acid (furnished by the plaster) can prevent its flight, and fix it in the soil. This can only be done, however, when the plaster is dissolved. The sulphuric acid then unites with the ammonia, and the carbonic acid of the ammonia unites with the lime.

Such is the purport of Professor Liebig's explanation of this great mystery. If he is correct in ascribing all* the effect of plaster to this new combination, its importance in the economy of our farms must be evident. All our fields, pastures and meadows, ought to be strewed with it; and in accordance with his suggestion, it ought to be scattered in all our stables, and over all our barn yards. The quantity required is not great; and many experiments may be instituted at a trifling expense.

I ought to say, however, that this theory appears insufficient for explaining all the phenomena, in connexion with the use of plaster. Why is its effect on clover so extraordinary, and on wheat so insignificant? Judge Peters, after using it forty years, said he never found it beneficial on winter grain; and others, after long trials, thought it did little for the natural grasses. All these, however, are powerfully affected by stable manure—by the very ammonia† which that manure yields. And what do we observe? Clover of luxuriant growth, and close along side of it, wheat without any indication of benefit received, though both have been plastered alike.

Again—Professor Liebig informs us that every shower of rain, or fall of snow, brings down ammonia to the ground where the plaster ought to arrest it, and the plants that feed on it ought to be more thrifty; but we have much testimony to

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* A late traveller writing from Italy, says of the peasants residing in the neighborhood of Vesuvius—"If their houses are burned, they return, when the lava cools, to build new ones, and cultivate *a soil inexhaustibly fertile.*"

* "The evident influence of gypsum upon the growth of grasses depends only upon its fixing in the soil the ammonia of the atmosphere."—Liebig, p. 142.

† "Animal manure acts only by the formation of ammonia."—Liebig, p. 136.

show that on many fields no trace of such improvement could be discovered. These facts may not be inexplicable; but they appear to me at present, quite sufficient to hang a doubt on.

I am aware that we have statements in regard to the use of plaster, of the most conflicting kinds, so that with some few exceptions what one denies, another affirms; but would this be so if it acts solely in the manner described by Professor Liebig? A simple cause might be expected to produce a uniform effect. For instance: poudrette is a simple cause; and as far as I have understood, it operates with uniform effect, whether on clover, wheat or cabbages.

On some soils, indeed, plaster is uniformly inefficient—not the trace of any effect is perceptible. This inertness has been more frequently observed in the *tertiary formation* near the sea coast; and therefore it was ascribed to the salt vapors. Plaster, however, succeeds well in many places on the coast, and fails in others far beyond the sea breeze, so that the cause seems to reside in the soil, and not in the air.

There are several substances that decompose plaster, besides the cabonate of ammonia. Carbonates of potash and soda have the same power. In the hands of the chemist, plaster and common salt readily change into sulphate of soda, and chloride of lime; and Judge Peters said, "I ruined a bushel of plaster by a handful of salt—it was unfit for either cement or manure." Some of the oxalates also effect its decomposition.

When this happens, the plaster no longer exists: and most of these results are not known to be of much value as manures. Such failures, however, rarely occur on calcareous soils, or on such as contain a due proportion of lime. There plaster generally proves beneficial; and even in England it has succeeded on such lands. Many years ago, in the south-eastern part of Pennsylvania, some farmers thought it would supersede the use of lime; but it gradually lost its effect; regaining it, however, when the land was limed. Wherever plaster proves of no use, therefore, try liming. On a small scale, it may be done at a trifling expense; and may lead to the most beneficial results.

And remember that plaster must be dissolved before it can do any good. Sometimes there is not rain enough for this purpose in summer, and therefore, there is always a risk to sow it late in the spring. Let it be done early.

I have now arrived at my last paragraph. From bogs or deep swamps manure may be manufactured to a great extent. Three parts of peat and one of stable dung are mixed together, and fermented through the summer. It was used in England* many years ago; and has been found in New England, equal to the same bulk of stable manure, and more permanent in its effects. †

CASKS FOR PRESERVING GRAIN.

From the Farmers' Cabinet.

Mr. Editor—On a late visit to a branch of the Cooper family, New Jersey, I observed that the granary, or place for stowing away grain of different descriptions, was fitted up with bins in the shape of very large and strong iron-bound casks of the usual shape; and in these, the wheat, &c., was preserved for any period, no matter how long, without fear of weevil, grain-worm, or any other species of vermin, or damp and mouldiness; the grain being introduced by means of a funnel through the bung-hole, which, when the cask is full, is very carefully closed and made air-tight, the hoops being driven occasionally to cause them to become so. Now by this very simple arrangement, the whole crop of grain on a farm may be preserved for years, as perfectly free from dampness or disease of any kind, as though it had been kiln-dried; the convenience of stowage being as great as in open bins; the casks standing on low tressels or sleepers, admitting a bushel measure under, they can be rolled on to the bung; or the grain might be drawn off by a large tap made for the purpose.

HISTORY OF THE CANE.

From the South Western Farmer.

We promised in a late number a history of the seeding and growth of the cane, which a few years ago was found in such abundance in nearly every part of this country.

At the first settlement of our state all the richer lands were found covered with a growth of this singular plant, so dense that travelling through it ten miles a day, with severe labor, was quite as much as could be done, and the only way to get an extension of vision further round than ten or twelve paces, was to mount a tree or some other eminence higher than the tops of the cane. The size and height of the cane varied with the quality of the land. On thin land it was found not thicker than one's little finger, and not higher than 4 or 5 feet. Increasing in size as the land was better, it was occasionally seen from two to three inches in diameter, and attaining the height of 30 or 40 feet. Until the year 1830 a considerable portion of the present corporation of Vicksburg was one of the thickest and heaviest kind of cane brakes, and all the uncultivated parts of that most fertile region of the world perhaps—the hills which strike the Mississippi just above Vicksburg at old Fort McHenry, and continue to skirt its shores as far as our boundary line extends, were clothed throughout with the perennial verdure of the cane's most graceful foliage. During that year nearly all the cane of this range of hills, and we believe of the interior on this side the Mississippi, blossomed, seeded and perished. The seeding did not extend to Louisiana, unless in a few small spots, nor did it extend to much of the river bottom on either side; and there were occasional clumps which did not seed until the following year, together with some that did not seed at all; though such were soon destroyed by stock.

The ripening of the vast quantities of seed during the summer of that year (1830) presented in those parts of the country where the cane was abundant, scenes of overflowing plenty, unequalled in any other land than one of fable. The grain was about the size of a grain of rye, and be-

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* Davy's Agricultural Chemistry.
† Jackson's Geological Report on Rhode Island.

gan to ripen towards the latter part of July. Each cane sending out a head of seed at the extremity of every leaf branch would yield perhaps a quart, and so heavy as frequently to bend the cane entirely to the ground. Cattle, hogs, birds, squirrels, and every thing which fed on it, became seal fat, and reveled until winter in the midst of the wasteful generosity of nature.

After ripening its seed, the cane withered and died entirely, though it did not fall to any great extent till the following year. It was then thoroughly matted over the whole surface of the earth, forming a layer of 6 inches or a foot of dry and combustible matter.

Those who have never witnessed that most sublime spectacle—a field of dead cane on fire—can form no idea of the scenes then frequent among us. A prairie on fire has often been the theme of description. But the terrific magnificence of the conflagration of a cane-brake we think unequalled. The fire may be known at the distance of 6 or 8 miles by a roaring like the coming of a hurricane, and a thick column of black smoke which rolls up in the horizon over the spot of the conflagration. Nearer to the scene, and yet not in sight, the incessant reports, caused by the explosion of the heated air in the joints of the cane, brings to the mind nothing more forcibly than the idea of embattled armies engaged by myriads in the work of death—while the giant monarchs of the forest, consumed at their roots by the devouring elements, occasionally tumble with a crash which jars the hills like the mingling of heavy artillery in the battle. Coming nearer, the scene which meets the eye makes the brain reel. A tumultuous ocean of flame seems rolling over the hills, leaving nothing but smoking ruin behind its thundering march. For a while perhaps the flame moves on evenly and regularly. Presently it is lashed to fury by the breeze and leaps ahead in long tongues of flame with the speed of a courser. Again as it sweeps up the ascent of a hill and gains the top, it will seem to leap away from the earth and try to seize the sky itself in its embrace. Occasionally as it meets a bunch of cane standing erect, or seizes on the dry bark of some tree it will be seen wreathing itself in columns forty or fifty feet in height and playing among the topmost limbs of the forest—making altogether, with the deafening noise—the vaulting flame—the dense clouds of black smoke—and the cinders which fall in showers behind it—one of the most sublime exhibitions of the power of the great element, fire, which we ever beheld.

After such a conflagration has passed over the land, as may be supposed, not a green thing is seen. The ground is left clean and mellow, with a fine dressing of ashes, and nearly every tree completely deadened. Cutting the cane and burning it off in this way, is the universal method of clearing in the cane regions; and the process leaves the ground in so fine a state that superior crops of corn are sometimes raised with no other labor than to stick holes with a stick where the corn is to be planted—covering with the foot and afterwards knocking down the *mutton* cane which will spring up from the old roots.

The manner of the growth of cane from the seed is peculiar. In the fall which followed the general seeding in 1830, the ground became covered with the young plants from the seed which had fallen and been neglected by the hogs. They came up fine and tender, very much resembling nimble-will grass; and stock grazed it with great eagerness. It continued green through the winter though it did not grow; and where the land was not burnt off as we have described above, and the stock was not plentiful enough to extirpate it, the cane again took possession of the soil. The peculiarity of its growth is in this: no stalk grows, no matter how long it may stand, more than it grows the first season it sprouts. It shoots up to its full size in a few weeks, and there remains till it dies. The roots however continue growing from year to year until they reach perfection, and as all the stalks after the first year shoot from the joints of the roots, so as they advance in growth, they send up every year larger and larger stalks until at last the *mutton* cane is seen to sprout up as large as a man's wrist and attain the full height and perfection of the plant. It is many years—some 8 or 10—before the roots attain their full growth and send up the full sized cane. The first year, from the seed, the plant does not grow higher than six inches—there it stands and grows no more. The next year suckers spring up from the roots of this first plant about the size of a goose quill and about 18 inches high—there *they* stand and grow no more. The following year still larger suckers spring up; and so on until the large mutton cane are sent up—which shoot forth to full size and height in a few weeks, and these stand until seed time again rolls round, and they bear their fruit and perish. Asparagus is the only other plant with which we are acquainted which has a similar growth.

We have heard a great many pronounce as to the length of the periods at which cane will seed. Some say, it will spring up, attain its growth and seed in 7 years—others that it will only seed every 14 years. Our own opinion is that both periods are too short, and that at least 20 years will elapse before the plants from the seed will in their turn produce. The cane from the seed of 1830 has not yet after 12 years attained the full size of its predecessors, in those parts of the country where it has been left unmolested; and we have never heard our oldest citizens speak of witnessing but one general seeding—that of 1830. Partial seeding however may be seen in nearly every cane break much oftener. A few clumps—sometimes several acres will run to seed, die and fall. These are no doubt bunches which did not seed with the balance and run their course out of the general order. A few dwarf cane too—about the height of a man's waist—may be frequently seen seeding in the midst of the larger growth. The exemption of most of the bottoms, on this and the other side of the Mississippi, from the general seeding of 1830 may be accounted for from the fact that overflows kill cane—and that which stood at that time in these bottoms was not probably of the same age as that on the hills. The overflow of '28 killed large bodies of cane and on lands habitually overflowed cane will not grow. On much of the ground where the cane was killed in '28 it has again sprung up from seed which either had laid dormant in the soil, or had been floated and deposited there by the water from other sections. As late as '35, when we were last to to any extent through the swamps of the Mis-

sissippi, the cane on land where it had been killed in '28 had not yet attained any thing like full size, even though it had been exempt from subsequent overflow; and the difference in the size of the cane was an unerring index by which to judge of such lands as the overflow of '28 had left uninjured.

The first feeling on contemplating the history of this singular though common plant is surprise that none of our planters have taken the pains of securing the seed and laying down pastures in cane. We take great pains to secure clover and other grasses of precarious growth among us, and have neglected this indigenous, hardy and perennial plant which we will venture to assert will sustain more stock to a given amount of ground than any grass we can cultivate. It is equally valuable at all seasons of the year. In spring and summer the young *mutton* cane, as they are called, which spring up as tender as asparagus and as quick, furnish a sweet and nutritious food which sheep, cattle, hogs and horses seek and devour with eagerness. And in winter, when nearly every thing else has disappeared, the cane continuing green furnishes a plentiful if not a very rich supply. Cane that is grazed from will not grow up to the usual height, but the plants as they sprout will cease growing where they are bitten off, and bunching out, form what is called switch cane, being the best for pasturing, as the higher growth is beyond reach. Most of our medium lands would grow cane, which, to follow the dictates of nature, should be sowed in the fall after the land is broken up perfectly loose.

Those acquainted with any section of the country where the cane is seeding, will doubtless confer a favor on the public by making it known, so as to enable those wishing seed to procure it.

THE FARM AND FARMING OF THE REV. J. H. TURNER.—NO. V.

Remarks on lime as manure. (a.)

For the Farmers' Register.

In one of my late communications I incidentally adverted to lime, and its use as an improver of the soil, and promised to resume the subject at some future time. This promise I now propose to redeem. And this I do rather with the view of *seeking* instruction than of imparting it. In fact, I enter on this subject with very great diffidence. What I have thus far written has been the result, for the most part, of my own experience and observation. Thus supported, I felt myself warranted in speaking in terms of confidence. But when *lime* becomes the subject of inquiry, I candidly confess my want of information, and give notice beforehand that I must rely more than I wish upon that too fruitful source of argument called *theory*.

It is true that I have made *some* use of lime, and on more than one occasion; and it is equally true, that I was most sadly mortified and disappointed in the expected results. Two of my near neighbors, A. Robinson jr. and F. Staples, esqs., as I before intimated, both used lime with no better success. But in all these cases, the quantity used was too small, and the experiments made too few, to warrant any thing like a general conclusion. I am not therefore prepared, with my few and imperfect experiments, to resist the immense mass of evidence which may be adduced on the other side of this question.

A few years ago I enjoyed the pleasure of passing through the luxuriant part of Pennsylvania embracing the rich counties of York and Lancaster. Almost every field I saw indicated the highest degree of improvement. The clover, the wheat, the corn exhibited a dark luxuriant hue, which plainly told the great fertility of the soil. I inquired into the cause of the beautiful scene which was every where spread before me, and in all instances received the same answer—the mighty agent was *lime*, which had converted that whole country into a lovely garden spot.

In addition to this, the editor tells us of the great and salutary changes which have taken place in Prince George, in Charles City, in James City, and in several other counties in eastern Virginia, all resulting from the same cause. Then we have the testimony of Dr. Braxton of King William, and of the Messrs. Wickham of Hanover, and of many other judicious farmers in other portions of our state, all tending to substantiate the same general result. With this overwhelming mass of evidence before me, I cannot withhold my assent, that lime is in some form or other a most excellent improver.

It is also worthy of remark, that wherever lime exists in a natural state, a foundation is at once laid for improvement to almost unlimited extent. It is this that has made the country around Lexington, in Kentucky, the lovely spot that it is. The hand of skill and industry is the only thing needed to convert the whole valley of Virginia into one lovely garden spot. Indeed, where the foundation is a lime-stone, *skill* may be in a great measure dispensed with; the chief things necessary are industry and patient perseverance. (*b.*)

But there are many other sections of country in which this important ingredient does not exist in a natural state. Here too is an almost endless variety of soils, differing from one another in nearly every essential quality. Some are silicious, others argillacious, and others again mixtures of both in various degrees. Some have a clay foundation, others a hard pan foundation, and others again are so unfortunate as to have no foundation at all. Now, it cannot be conceived that the same material which is profitable to one must necessarily be profitable to all. We cannot admit the Thomsonian principle, that the medicine which causes one disease, will also cure its opposite. Hence results the absolute necessity of that skill which grows out of a long course of close observation and careful experiment. And hence we may account for the fact, that in the use of lime, so many mistakes have been made, and so many disappointments have ensued. (*c.*)

Nor ought it to be forgotten, that this article, which is so useful in some circumstances, is positively injurious in others. It either cures or kills the patient. We can never administer it on the principle, that if it does no good, it will do no harm. Lime is in its very nature so caustic and active, that it will always act either for good or for evil. It is therefore an exceedingly dangerous article in the hands of the injudicious and

inexperienced. As intimated in a former number, the writer, with others, has already been injured by it. Hence the great necessity of a close and intimate acquaintance with this whole matter, before we tamper with an article so dangerous. (*d.*) As a mortified and disappointed farmer, then, I do hereby call on those who are now reaping the rich harvest of their successful enterprises, to come forward and tell me and the public the whole secret of their success. And as I have reason to fear that the farmers will do on this, as they have done on many similar occasions, put off the thing from time to time, until it will never be done, I do in my own name, and in the name of many others, call particularly on the editor to take this matter in hand once more, and to give us the result of his long and intimate acquaintance with this subject. In common with many others, I hereby record my great and lasting obligations for what the editor has already done; but he will allow me to say, that his previous communications have dealt too much in mere *generals*. Being intimate with the subject himself, he has fallen into the error, too common among writers, of supposing that his readers also had some acquaintance with the subject. Whereas many, if not most of us, are still profoundly ignorant, and thus venturing in the dark, have sustained considerable injury. What we seek for then is not *generals*, but *particulars*. And that the editor may be at no loss to know on what points we wish to be informed, I will here state a few of them. We wish particularly to know,

1st. What kind of land lime specially benefits. Whether silicious, or argillacious, or a loam? (*e.*)

2d. What kind of a sub-soil it ought to have. Whether a red or white clay, or hard pan? (*f.*)

3d. What proportion is proper to the acre on each kind.

4th. In what state it ought to be applied. Whether caustic or mild? (*g.*)

5th. What is the most suitable time to make the application.

6th. On which can most reliance be placed, on stone-lime, on shells, or on marl?

7th. Ought the applicatien to be made as a top-dressing, or immediately covered?

8th. What crops are most benefited by it, and what crop ought immediately to follow the application?

9th. At what intervals ought the process to be repeated? (*h.*)

10th. Is it ever safe to apply it to poor naked land? (*i.*)

I have stated these queries just as they occurred to my own mind, without any reference to order, and I should be very thankful for a minute answer to each of them.

Having now professed my ignorance of this whole subject, it may seem strange to say, that I have any theory at all about it. But the fact is, I have experimented a little, and, with the aid of observation, reading and thought, have ventured to form my own theory; and, as it differs somewhat from any I have seen, I will frankly detail it.

According to the best information I have been able to obtain, the use of lime as an improver has been of recent date. Virgil, in his Georgics, and other Roman writers on agriculture, as far as I recollect, make no mention of it in this respect. About forty years ago, Sir Humphry Davy established his experimental farm in England. Previous to this but little wheat was raised in that country. Their supplies were derived, for the most part, from other portions of the world. Indeed, the opinion was very general that wheat could not be raised advantageously in that country. In this state of things, Sir Humphry, among his other experiments, after applying lime to his particular soil, succeeded in raising fine crops of this grain; from which he drew the general conclusion that lime was the great desideratum, and that the soil of England would produce wheat when supplied with this article. With this high authority before them, the farmers of that country generally resorted to the use of lime, and, whether it is owing to this cause, or to other sources of improvement, the fact is, that England has become one of the best wheat growing countries, so that it now produces a large proportion of its needful supplies. (*j.*) But it is worthy of remark, that the ardor which once prevailed on this subject seems now, in a great measure, to have subsided. We constantly hear much said about other and newer manures, but we hear but little said about lime. From this I conclude, that lime with them has pretty well had its day—the whole energies of this enterprising people being now directed to other materials, which are probably destined in their time to be superseded by something newer, and therefore still better. (*k.*)

How long lime has been used in *this* country, and *where* its use commenced, I frankly confess my ignorance; but, if I am not greatly mistaken, its general use in Virginia commenced *after* the publication of the editor's 'Essay on Calcareous Manures.' And here, without intending any compliment to Mr. Ruffin, I consider it but sheer justice to say, that to him we are indebted for most, if not all, the benefits which have resulted from the use of this article. After expressing myself as above, it may seem strange that I should wish to impose on him still more trouble. It is simply because I like what he has written so well, that I wish him to write more, in which new effort I hope he will not deal with us as having taken our diploma in this art, but will condescend to treat us as A B C scholars.

There is, however, one term frequently occurring in the above treatise, and often repeated in almost every subsequent treatise, to which, if I understand it aright, I must offer my unqualified protest. The term alluded to is, that lime is specially useful in *fixing* the manures in the soil. The old theory was, that lime was not an enricher, but acted as a stimulant, powerfully urging vegetation to seek and to appropriate to itself all the nutriment that might be in its reach. This theory seems to be now very generally exploded, and in lieu of it, we are told that its special use is in *fixing* the manures in the soil. Now what is the meaning of this word *fixing?* Are we to understand by it, as it seems naturally to import, that, by applications of lime, manures are made more permanent and durable, and thus actually last longer?(*l.*) If this be the meaning, the editor and I, and all others who understand the thing in this way, must join issue. For what is lime? And here, without attempting a chemical analysis of this substance, it will answer my present purpose

to say that, in its very nature, it is a strong caustic alkali, the natural and direct tendency of which is to reduce to their original elements all the substances, both animal and vegetable, to which it is applied. Lime, for instance, finds substances in a solid or liquid state. It changes them from this into the aeriform state, and then they pass off in the form of their various gases. Hence its great efficacy as a cleanser of stercoraries, and other offensive collections of decaying matter. The ammonia is speedily driven off, and the residuum is left in a sweet and harmless state. If then this be the direct tendency of lime, it seems to me to be the very last thing to make manures more permanent. Instead of *fixing* them in the soil, it decomposes them, and the gases being set at liberty, will make their escape.

Now whilst stating the above, I readily admit that applications of lime to coarse unfermented manures, may be of very great service. (*m.*) Manures in this state decompose very slowly. It is also of very great service to lands filled with turf and other vegetable matter, in an inert state. Such manures commonly decompose very slowly. If they evolve their gases at all, they do it so slowly as to furnish very little nutriment to growing vegetation. Hence it is that no judicious farmer expects much *immediate* benefit from applications of coarse materials from his farm-pen, or from dry straw or dry litter from the woods. It is now pretty well ascertained, that it is the *gases*, and the gases alone, which nourish our crops, and that these are evolved only during actual decomposition. Now, with manures of this kind, lime must be very useful. It hastens a process which would otherwise be slow, and the crop being already on the land, takes up the gases as they are set at liberty, and thus receives benefit. It is in this way that I account for the fact that in the few applications of lime I have made, one was successful, the others were mortifying failures. The successful application was on land newly cleared, covered with litter, and filled with small fibrous roots. Here the lime had vegetable matter to act upon, and the growing crop derived the benefit from the rapid decomposition, which the lime caused it to undergo. In the other instances, the land was naked, or nearly so, and the lime having nothing to act upon, no gases were evolved, and consequently no food was furnished to the crop; and as might naturally be expected, the whole affair, expenses, labor and all, terminated in a "splendid failure." I would not therefore hesitate to recommend considerable applications of lime to forests to be speedily cleared, or even to old fields pretty thickly covered with young pines, which it is intended to reclaim. Then I would leave the brush and other litter, for at least one year; after which, I should expect to bring the land into successful cultivation, not by *fixing* these materials in the soil, but by subjecting them to a rapid decomposition, and thus (if I may be allowed the expression,) *unfixing* them.

But perhaps the editor and other writers who are fond of this term *fixing*, may mean something else. They may mean that lime, where manure or other vegetable matter already exists in some form, does, by rapidly decomposing the same, saturate the soil with fertilizing gases, and thus impart a vigor which will enable it to throw up a strong crop of vegetation, which, falling and decaying on the land, will not only keep it in good heart, but actually improve it. In this way the original manure has not been fixed or made permanent, but it has imparted to the land a vigor and fertility which enabled it to cover itself with a strong crop of vegetation, and this, in its turn, decaying on the land, makes that fertility permanent. If this be the meaning, I give it my hearty concurrence; and thus it falls in with my theory on which I slightly touched in one of my former numbers. But then it ought to be borne in mind, that lime does not make the manure *permanent;* it merely hastens that process by which the manure is changed from an inactive to an active state, and then a permanency of fertility is insured by successive crops of vigorous vegetation. Instead, therefore, of the lime *fixing* the manure, the manure is fixed by means of successive crops of vegetation, which constantly rising up and then decaying on the land, make fertility permanent. It is these constant additions and accumulations of manure which can by any possibility fix or make them lasting. The idea therefore I wish to convey is simply this, that no applications of lime on a previous manuring can so fix that manure as to render subsequent manurings unnecessary. On the other hand, if the crops be removed and no equivalent be returned, the land will constantly decline, so that, instead of *fixing* the manure in the soil, we shall fix something there which we will find infinitely worse. (*n.*)

Or perhaps the meaning of this term may be that lime is specially useful in neutralizing or destroying that principle in *acid* lands, which seems to render applications of manure to such lands almost useless. Now I pretend not to say what that principle is. It may be acidity itself, or it may be something else which always abounds in acid lands. But be it what it may, there is something in such lands, as every observant farmer well knows, which seems to dissipate and scatter to the four winds his manure, almost as fast as he applies it. The whole fertilizing effects of the manure seem to be exhausted upon one single crop, so that the land is almost as poor at the end of the year as it was at the beginning. I have some such land, and I have often wished it was in the moon, or any where else out of my sight. It cost me just as much as the best land I own, and I hereby offer to *give* it to any one who will take it away, so that it may never harass my sight or purse any more. (*o.*)

Some persons are of the opinion that manure *sinks* in such land. But I cannot think this correct, for, on examination, I find that if it have any foundation at all, it is a hard pan so obdurate that it can scarcely be penetrated, even with the pickaxe. This being the case, I cannot admit the idea that the manure *sinks*. I rather incline to the opinion that the manure is dissipated, and thus rises up and goes off, not in the form of ammonia, but of some other gases which do not nourish vegetation. But be this as it may, a question of much more importance is, how is this evil to be remedied? Can this malady be cured by lime? Or is it to be ranked with cancer, consumption, and other incurable diseases which afflict the human body?

But we often meet with acid lands, which are not imbedded on a hard-pan substratum. Most

of our high-lands, where pine is the prevailing growth, are of this description. Here the soil is generally of a light silicious character; and here lime, judiciously applied, I doubt not, is very beneficial in rendering the manures permanent. The great desideratum here is something to neutralize the acid, and as it is well known, that alkalies will have this effect, lime, next to manure, must be the "one thing needful."

One word as to the discussion which has been going on for a short time between Mr. Nicol and myself. The editor, in the last number of the Register, calls it a "*controversy*," and seems to intimate that it has been carried on with unkind feelings. Now to this term, and to this insinuation, so far as I am concerned, I enter my solemn protest. I never entertained one unkind feeling towards Mr. Nicol; and judging from what appears in his "rejoinder," I would think that his feelings are as kind and respectful towards me. The truth is, that when I wrote my piece, I mistook my man. His communication was dated "Sandy Point," and from his frequent reference to the same place, I naturally supposed that he was the proprietor of that great estate. As such I prepared a dish into which I threw some salt. * * * * * * * * In fact, I made it a pretty pungent affair. But then this mess was not intended for Mr. Nicol. * * * Had I known or even suspected that Mr. Nicol was the worthy manager and not the proprietor of that great estate, my bill of fare, if I had furnished any at all, would have been of a very different order. I now not only know who Mr. Nicol is, but have had the pleasure of seeing him at the late meeting of our Agricultural Society. I was exceedingly busy on that day, so much so that I could only give him a cordial shake of the hand, intending to intimate that I had no unkind feeling towards him, and if he had any towards me, I verily believe that I *shook* it out of him. So that we are now better friends than we ever were before.

But I must say one word to the editor. He says, he has pruned both of us. How much he pruned Mr. Nicol, I cannot tell; but he has pruned me so close as to leave almost nothing but the stump. Finding, as he supposed, too much salt and other seasoning in my dish, he undertook to take it out, and in so doing, he will allow me to say, he has pretty nearly verified the old saying, that "too many cooks spoil the broth." If therefore he will allow me to "shoot no more bolts," he will in his turn be very careful as to the criticisms which he admits on my anonymous essays. I feel just as tenderly for my brats *without* a name as *with* a name.

J. H. TURNER.

Notes by the Editor.

(*a.*) It has never been our usage, nor inclination, to exercise the almost universally assumed editorial privilege of replying to opponents in advance of the publication of the pieces so answered; nor even to answer by appended notes, as will be done here, and has been done in a few former cases when, like this, it was manifestly more convenient and better for the clear understanding of both sides to take that course. In the present case, the manner of the call made upon us, and our respect for the source from which it proceeds, both forbid us to neglect it, and pass it by silently. And yet, if it were attempted to answer the call fully, and in a separate and substantive article, it would be necessary to quote and repeat the many questions, and state at length the many objections or difficulties to be replied to, so that the reply could not be otherwise than very voluminous and tedious. Therefore, to save time and words, we shall take the liberty of appending in notes, at the end of the communication, the particular answers or remarks that may seem necessary—and will refer to other accessible sources for the more full information which may still be wanting, notwithstanding these notes.

The ground of discussion now presented by our correspondent is altogether different from what we had asked for and expected. We had requested (at page 154,) a statement of the particulars of his own applications of lime, which had totally failed of effect, (really or apparently;) and we had hoped to be able to find out from such statement of particulars, and to point out, the causes of the failures. But instead of our being permitted to pursue that course, and perhaps to occupy something of *new* ground on this subject, Mr. Turner has gone more upon theoretical views than practical matters, and has required many answers and reasons which had been (as we had supposed) already presented by us at sufficient length, and with sufficient clearness, in previous publications—and which, if repeated here, would be a long and wearisome task. For one question put to him, he has answered by asking twenty more. In some respects, if not all, to which the foregoing observations may apply, our esteemed correspondent must pardon us for expressing the doubt whether the fault which causes the necessity of further explanation to him of our views be not more in his own slight attention heretofore given, rather than of our want of fulness and explicitness in former statements. However, be that as it may, we desire above all things to be as plain and as clear and intelligible as possible in all writings upon agriculture; and we will bear in mind these our friend's difficulties and objections, as well as any others known, and endeavor to remove some of them, hereafter, by using still greater care in preparing the next edition of the essay to which he has referred in such kind and gratifying terms of general commendation. The publication of such an edition, en-

larged and increased in value no less than in bulk by the addition of more recent lights and later experience, is designed to be commenced some time within this year; and in the appropriate parts, whether of reasoning or of statements of practice, the alleged existing defects of sufficient fulness or particularity will be had regard to, and supplied when deemed requisite. Referring then to the last edition of the "Essay on Calcareous Manures," or, when that is really deficient, to the next forthcoming, for whatever may he here omitted, we will proceed to give such answers on particular points as may appear necessary.

(*b.*) In the preceding paragraphs, the writer seems to have withdrawn his previous denial (as we understood it) of the general benefit of and general necessity for calcareous manures on soils; and to become their eulogist in as general and as strong terms as we should be disposed to use. But still we would desire to bring back the discussion to the ground on which it was raised, viz.: the particular facts of the failure of Mr. Turner and some of his neighbors (in some or most cases of trial) to obtain any benefit from liming. We were before sure that Mr. Turner did not entertain the slightest doubt of the facts of success alleged by the several individuals to whose practice he has now particularly referred; and we are just as far from doubting his failures, or the occurrence of such facts in his practice as served to form his belief of his applications being failures. But the business is not to defer to authority, no matter how good, but to try to reconcile these apparently opposing facts and results, by presenting all the circumstances of both modes of trial. This we have aimed to do, in former publications, and at great length, as to *our* results, both successful and unsuccessful, and will add any deficient particulars that may be hereafter required. In regard to the opposite results of Mr. Turner, the circumstances are stated so slightly and so generally, that it may be presumptuous for us even to pretend to judge of the causes of their failure; but nevertheless such causes as seem probably to have operated, and such reasons as seem to apply, will be mentioned.

We understand from the former concise and general statement and present repetition of Mr. Turner, merely that he (and two of his neighbors also) applied lime to soils almost naked and barren, and found no effect or benefit whatever therefrom. Now, though we believe that there was a great mistake as to there being *no effect* ultimately produced, still we would freely admit, (and it would be precisely what we would have anticipated and predicted of such an application, and such circumstances,) that there would be no early and obvious improvement—perhaps not enough to be distinguishable, and certainly not enough to be profitable, without putrescent matters being also applied at the same time, or afterwards. The great and most beneficial operation of calcareous earth as manure is to combine chemically with putrescent manure, or any matters serving to feed plants, and thereby "*fix*" in the soil these otherwise fleeting and wasting matters. If there were no such enriching or alimentary matter in the soil, of course no such beneficial *fixing* action of lime could take place—and on an exceedingly barren soil, exhausted by tillage and close grazing to the lowest possible degree, this action might be so little as not to be perceptible. Nearly all our own practice and earlier cultivation have been on originally bad soils and very poor and exhausted lands; but excepting the numerous and extensive galls of the washed slopes and hill-sides, we had no experience of land so excessively poor as Mr. Turner described his to have been when he commenced operations, and when (as is presumed) he applied the lime. But even though no early benefit from applying marl or lime be *seen* when applied to naked galls, or to other almost as barren land, the application would give to such land the power of combining with, holding, and thereby receiving benefit from, putrescent manures (or any vegetable matter) afterwards to be applied. Now we presume (in the absence of any express statement) that this land so limed by Mr. Turner, without benefit as he supposed, has been since heavily and repeatedly dressed by putrescent manure, and, like his land generally, has been highly improved by such lavish manuring. Now suppose that the small quantity of lime before applied has actually and fully performed its office of *fixing* in the soil as much of the alimentary matter since given as it could combine with, this small effect, however valuable in proportion to its extent, would be lost and invisible, amidst the ten-fold greater quantity of putrescent matter applied every three years, and which was, as *we infer*, mostly wasted for want of lime to combine with. According to a previous statement of Mr. Turner's, (p. 151, 2,) he found his applications of putrescent manures, (much of it rich manure from town stables, 1250 bushels to the acre,) to show "an evident falling off in the second, and especially in the third and fourth crops [or years.] This made a second manuring necessary; and," he adds, "I am now convinced that excessively poor lands, such as mine were, cannot be made permanently rich under *three* distinct manur-

ings." For our part, we suspect that *thrice three* such manurings (of putrescent matter alone) will not be *permanent*, without lime applied in some manner (*and coal ashes* is one, though a feeble source of supply,) is given to the land also. Now, according to our view, if a sufficient dose of *mild* lime had been given *before* the first putrescent manuring, even although the benefit of the lime had not been distinguishable at first, nor appreciated since, it would have caused two of the manurings to be as serviceable as the three, up to this time, and much more in all future time. And if this view and opinion were admitted to be true to the fullest extent, still it will be manifest to the reader, inasmuch as such effects are merely *preservative*, and where other far more immediate and active manures are lavishly applied afterwards, and repeated in rapid succession, that the effects really due to the lime might not be known and appreciated, or if seen at all, would be ascribed to other causes. Especially would this be the case, when the true action of lime in soil was not understood, or such benefits from it are expected as are produced by putrescent and alimentary manures.

But in our own practice, the "fixing" and preservative power of lime was had in view, and such effects looked for; and such as was our own poor and bad land, (and poor and bad enough it was,) we have never made an application of marl thereon that was not both effective and profitable; nor even on a naked gall, which was not effective in improving it, by fixing other and alimentary manures, (if such were added in any manner,) though perhaps such improvement of galls might sometimes cost more than the land was worth after the highest improvement thereof.

We do not, however, pretend to set forth our own limited experience of results, in a particular locality, as indicating precisely such as are to be expected in other localities, where other and unknown conditions of soil may exist. And we are ready to admit, in advance, that there is existing a difference of circumstances, of which the causes are unknown to us, in soils above and below the granite range, or falls of the rivers, though of like texture and general appearance. And we have inferred, as different effects of this unknown difference of causes, that gypsum is more generally active and useful on lands above the falls than below; and lime and calcareous manures generally more effective and profitable below the falls than on lands of similar appearance above. On this interesting question, many facts and proofs are wanting. And, to gather all the light desired, the advocates of either of these manures, generally, should not insist that their rule of action, however good for themselves, is of universal application; but should also examine for, and give all due weight to, the real or apparent exceptions to be found elsewhere. We freely acknowledge that we are much in the dark on this as on many other particular points of this general and extensive subject for investigation.

But Mr. Turner admits the propriety, and probable profit, of liming his land, *after* he has or shall have applied three successive heavy dressings of putrescent manures, at intervals of three years each. But it would have been far better to have applied the lime before. The full comparison of our views and statements would bring us both nearly to one point of agreement in this respect. The only remaining difference seems to be, that, while we recommend making ready and applying the *preserver* before exposing to waste and loss the thing desired to be preserved, Mr. Turner's opinion and designed practice would reverse the order, and furnish the means for preservation 3 to 9 years after the putrescent manure had been applied, and during all which time, by his own showing, it had been rapidly wasting. The putrescent manure he most correctly regards as his great treasure. The calcareous matter in soil, or to be applied to soils, where not existing, is the *lock* on that treasure. Is it then most judicious and economical, to furnish the lock *before* there is yet any treasure to secure, or to wait until after it has been for years in a state of daily extraction and waste?

(*c.*) It is very far from being the fact, that the same prescription of lime for soil is made for opposite diseases. The disease is *one*, though there may be some variation of minor symptoms according to difference of the constitution and previous treatment of the patient—and that disease is the great deficiency of lime, without which in sufficient quantity no soil can be good. In charging upon these soils the cause of their worthlessness, the allegation must be of what is *absent*, and not what is *present*. We had the misfortune, within the last few hours, to be compelled to hear the speech of a very windy and magniloquent member of the bar, who in referring to the baseness of an individual whose case and character were in question, said that "he was brim-full, to overflowing, with the total want of all moral rectitude." Now all these bad lands, however various and numerous their vices and defects, are all "brim-full, and to overflowing, with the (almost) total want of" *lime*. Therefore, the disease, or the foundation of the complication

of diseases, being one and the same, there is no quackery in prescribing one remedy as essential for all.

(*d.*) In the "Essay on Calcareous Manures," the author particularly, as well as *generally*, stated that the carbonate of lime, or *mild* lime, (as presented in marl,) was what he had almost exclusively operated with, and to the operation of which his theory and rules applied. *Caustic* or quick-lime was particularly excepted, though a particular consideration was given to that important exception, (See Essay on Calcareous Manures, 2d edition, pages 32 to 35.) The *only* condition of soil for which we there recommended *caustic* lime, or even thought its use allowable, was that of newly cleared or fresh land, full of vegetable matter; and it was in precisely such a case that Mr. Turner found decided benefit and profit from the application. In all other cases, (and we would not insist even on that one exception being requisite,) we would prefer to have the lime *carbonated* or rendered mild, by exposure and absorbing and recombining with carbonic acid. This end will be sufficiently secured by the mode of application introduced by the late Fielding Lewis, and which was described in no. 1, vol. i., Farmers' Register, and is in general use on the lower James river, wherever lime is applied. Any other mode of sufficient exposure to the atmosphere, that would reach the same end, would as fully guard against all the danger feared from the *causticity* of lime. And wherever such evils have been suffered, we must be permitted to say that they have not only *not* been attributable to our published instructions and advice, or the want of stating exceptions, but in direct opposition to both our general views and particular statements. If all the persons who suppose they have suffered injury from the too general opinions or incorrect instructions in the 'Essay on Calcareous Manures,' were examined as to the grounds of their charges, we suspect that it would appear that nineteen in twenty of them had not so much as read the work.

(*e.*) Liming, (in the sense stated in the last note,) operates more quickly and fully (for the first crop,) on silicious or sandy, than on clayey and stiff soils; but beneficially and profitably on all grades of texture of soil, if deficient in lime, as a natural constituent.

(*f.*) We care nothing about the subsoil, provided it be not *wet*, which bad quality is indeed an effectual bar to improvement by lime, as well as by every other known manure. We had some little red and more of white clay sub-soil; but most of ours was barren yellow sand sub-soil, generally deemed the worst of all; and on land having this very base sub-soil, our improvements by marl have been the most striking and most profitable. This is the kind of sub-soil, we infer, that Mr. Turner speaks of as of land having "no foundation at all." We would desire no better foundation for improvement by calcareous manures.

(*g.*) In giving the following particular answers as required, to particular questions, we must repeat, and beg that it may be borne in mind, that we have almost no personal experience of *caustic* lime as manure, and do not approve its use, unless in some very few cases; and, except when especially and expressly referring to *caustic* lime, that our remarks will here apply, as heretofore, to the *carbonate of lime*, whether as presented naturally in marl, or by burnt lime, after becoming mild by exposure.

(*h.*) Some portion of the questions, from 3d to 9th inclusive, have been already answered in the preceding remarks, and all of them susceptible of being precisely answered, as we conceive, in the report of Fielding Lewis' farming (above referred to,) and in the 'Essay on Calcareous, Manures.' And to answer fully here, would require 20 more pages of addition to these notes. In regard to burnt lime, (though that always becomes very soon carbonated in the usual practice of exposure, and before the first crop begins to grow,) some more full and valuable information is also presented in a preceding article, respecting the liming on Brandon, (page 279.) As it respects the *kind* of lime, provided it be but rendered mild, we should care very little as to what source it was derived from. Whether found in marl, or new or mild burnt lime, and whether from stone or shells, the only important consideration is, of which kind can a dollar's worth of labor and money furnish to the land the greatest number of pounds of *carbonate of lime.*

(*i.*) It is always "*safe* to apply it to poor naked land"—if it be *mild* lime, and not in excessive quantity for the circumstances of the land.

(*j.*) We would by no means concur in the several opinions and statements expressed in the preceding parts of this paragraph; but it is unnecessary to object to them, as they do not affect our positions. It is enough that we agree with our correspondent in his last stated position, that lime has generally been used in Britain, [where needed and accessible, we would add,] and that the greatly improved production of that country "is due to this cause, or to other sources of improvement." We would only desire to substitute the word *and* for the "or" above—giving to lime

the credit of a large part, but only a part, of the great agricultural improvement of England, and still more of Scotland.

(*k.*) We might well afford to concur in the opinion expressed, that lime in England "has had its day," but in a different sense from what is above intended. Lime *has* "had its day," indeed; that is, it has performed all its proper service, wherever it has been fully and sufficiently applied to give the needed change of constitution to the soil, and still to leave enough excess of lime to combine with and fix any early expected additional supplies of putrescent manures or other alimentary matter. In this sense, marl also "has had its day" on some farms we know of in Virginia, and the use there has been discontinued for some years. But it was only discontinued because all the surface had been fully marled; and other manures have been since sought to be applied, in preference, and almost exclusively, because these manures, vegetable and animal, are now highly profitable. Still the benefits at first derived from the marl continue and increase with every year. No advocate for the use of calcareous manures, who knew any thing of their true operation, has recommended their continued repetition—or their being substituted for putrescent, or for all other manures. In our own case, we have not only almost ceased to supply marl (for the above reason,) but have become as ardent as is Mr. Turner for applying putrescent manures on the lands where the marl "has had its day," and where, before marling, the application of putrescent manures was almost labor and expense thrown away.

(*l.*) Precisely—such is the *effect* of what we have termed the power of calcareous earth of "fixing" putrescent manures—and the mode of that operation, we maintain, is that the calcareous earth forms a chemical combination with both the soil and the putrescent manure, and thus retains the manure, and makes it permanent, until and except so far as the superior power of growing plants shall withdraw the putrescent manure for their sustenance from that combination. As we have never ascribed this power to the causticity of quick-lime, nor advocated lime while in a caustic state for this operation, all Mr. Turner's objections to caustic lime on this score might be admitted, without affecting in the least our position in regard to the "fixing" property of mild lime.

(*m.*) *We should* object to the mixing of caustic lime with even the coarsest of manures, if they had any rich and very putrescent matter intermixed—for to such matter the contact of caustic lime is always injurious, in the manner which Mr. Turner has correctly stated.

(*n.*) Having before stated what we meant by the term and the operation of the "fixing" of manure, by calcareous earth, it is not necessary to say any thing farther in regard to any mistaken inferences of our meaning. One small exception however it may not be improper to express, which is to state that we certainly *did not* mean to maintain the position, which Mr. Turner here opposes, that any "applications of lime on a previous manuring can so *fix* that manure as to render subsequent manurings unnecessary." He who would assert such doctrine, and as founded on his own practical experience, would deserve no respect for any other opinions, either in reference to his judgment or his veracity. In the first case, lime, (meaning *mild* lime,) applied *on* a previous cover of putrescent manure, and which was of course passing off in more or less waste, could not possibly be thoroughly intermixed and combined with the manure, so as to stop the waste, or to retain as much as the *amount* of lime under more favorable circumstances might combine with. This effect would be much better produced by the lime having been made the *first* application even to "dead land," and so thoroughly incorporated with it, that the manure would meet lime every where. But even that would not serve, except so far as the quantities of the calcareous and the putrescent manures were in proportions suitable to combine with each other. If the lime given to an acre be sufficient to combine with and fix and save only 100 bushels of putrescent manure, and 1000 be put on, the 100 may be saved, but 900 will be lost as surely and as quickly as if no lime had been applied. But even that amount of putrescent manure, and its fertilizing action, which the lime in a soil *could* fix and retain under a lenient and judicious course of tillage and rotation, (whether it be equal to 100 or 1,000 bushels of stable manure to the acre,) certainly will, in time, be drawn from the soil by the crop, if under severe and continued tillage, and removal of all the growth. And so (though it may require a long time and much trouble) may the best natural soils, such as were limed by the hand of the Creator, be also exhausted and reduced to poverty. But even when so reduced, the fixing and recuperative power of the lime in such soils will be apparent, if any chance for recovery be allowed to the land; as it will improve rapidly, and get rich again, if but left to itself; whereas Mr. Turner's poor land, and ours, that were "born poor," would remain so for ever, if left to get rich merely by rest, and their own growth for manure. Therefore, the admission that a marled or limed soil, after being enriched, *may* be empoverished by scourging cultivation, is not a contradiction of our position of the *permanency* of the improvement made by calcareous manures, and also by putrescent manures

combined with them. It is enough for this position, that land so improved can bear any judicious and farmer-like system of cropping, in grain and grass, which gives a proper return to the soil, though taking off much more in frequent crops. Such, for example, is the Westover and Brandon four-shift rotations, of three crops of grain and one of clover in every four years; yet the land is kept *improving* under that heavy draught on its productive power, after liming, with only the manures of the farm, and gypsum. If Mr. Turner were to stop his heavy dressings from purchased manures, even after having made the land as rich as is possible without lime, how long would his land bear up, under such heavy exactions as those referred to, and retain all its previous and highest power of production?

(*o.*) As much as Mr. Turner would seem, in some parts of his remarks, to oppose our views in regard to lime *in the general*, he furnishes in *particular statements* the strongest confirmation of them. And here is a very remarkable case in point. There *is then some soil* that Mr. Turner's generous and even lavish and repeated triennial manurings *cannot make rich* temporarily, much less keep rich? If we were to say that the cause were wholly (as no doubt it is in part, as Mr. Turner supposes,) the acidity of such soil, (or something else,) which "seems to dissipate and scatter to the four winds his manure, almost as fast as he applies it," and lime would remove this evil, and let the manure act and remain as on other lands, it would be but presenting the "fixing" proposition in a different form. Without having seen or had any experience of any land so bad as he describes, and without entering upon the discussion of the *modus operandi*, we can venture to assert that "the something" and the whole matter with this soil, which causes such very uncommon bad qualities, *is the want of lime.* And so sure are we of this, that if we were residing in Mr. Turner's neighborhood, we would accept this land which he offers to give away, and think that we could show him that the making it calcareous would make it abundantly retentive of putrescent manure. Of course, we infer that the land so described and denounced is dry, and *has a soil*, however poor it may be. If land be wet, and remain undrained, improvement by lime, or any other means, is hopeless; and if the original soil has been washed away, or otherwise removed, though improvement would be quite feasible, it would be of more cost than profit. We presume however that Mr. Turner does not refer to any such extreme cases as these, any more than to surfaces of entire rock, or pebbles, or of blowing sand, where soil had never existed. As to all ordinary and naturally poor soils, and including the poorest of them, we entertain no doubt of their being universally susceptible of high improvement by lime; and that by using lime thereon judiciously, from one half to perhaps nine-tenths of the putrescent manures may be saved, which would be otherwise required to maintain any certain grade of increased productiveness.—ED. FAR. REG.

REPORT TO THE STATE BOARD OF AGRICULTURE,

ON A PART OF NANSEMOND COUNTY.

Chuckatuck, May 16, 1842.

Mr. Edmund Ruffin, Corresponding Secretary of the Board of Agriculture of Virginia.—I received your communication (circular) only a few days ago, the letter having been addressed to me at Suffolk, and in compliance with the request, will answer such of the queries therein contained as come within my knowledge, though imperfectly.

My observations will be confined mostly to the land on Nansemond river and its tributaries, though they will suit the greater part of the county, except for the want of marl off the water courses, with which we abound on the banks of the river, with shell marl, or rotten oyster shells and decomposed vegetable matter, forming an almost black surface soil of 6 to 12 inches deep, the former settlements no doubt of Indians. Occasionally, on the river bank, and always on the creeks and coves, is found an abundance of marl, formed of clay and marine shells, both of which have been applied with good effect on our lands, when used with judgment; but owing to a want of knowledge of chemistry, and the caustic effects of calcareous matters, it was used so lavishly some years ago, as to render the land entirely unproductive, and will require many years to reclaim it, by rest and the use of vegetable matter, and the contents of the farm-yard. This injury is only partial, however. One field in this neighborhood was marled some eight or nine years ago, at the rate of 800 to 900 bushels per acre, the crops of which have never since paid one half the expense of cultivation; the land had been heavily cropped several years before, was worn down and naked; but in every instance, that I know of, where 100 to 150 bushels to the acre have been used, it has acted beneficially. It is difficult to overcome prejudices, and many will not use it, from the injury sustained by some by over-marling.

Most of our lands are what may be called level, and generally are so, except on the water courses there are some inequalities, produced by coves or guts running up into the fields.

The climate is vacillating, produced by our contiguity to the seaboard, generally feeling the influence of the sea breeze or easterly winds; indeed since my recollection it has changed very much, having later springs and earlier autumns, so much so as to render the cotton crop precarious, and causing the cultivation of it to be entirely abandoned.

Now, our crop is mainly corn, with peas, and oats, and potatoes, and melons, on or near the

water courses; some few cultivate wheat, though very few; but few sow grass seed, and then the preference is given to red clover, which is mostly grazed, very little cured for hay, so that our cattle have to subsist during winter on corn tops and husks, and by the spring are generally perfect Rosinantes.

The arable part of farms is generally small, 30 or 40 acres to 200, some few 300 to 400. Husbandry has been injured and retarded very much in this county, by the facilities afforded for speedily converting our labor into money, by lumber and the products of the river realizing more from an effective force, (men,) than the slow returns of agriculture on worn lands, few being able to employ such force in clearing or improving their farms. Still there has been some improvement in management by husbanding manure, by penning the cattle, and littering the pens, which is applied in the spring on the corn ground mostly in the hill, or on the sweet potato and melon crops, by those living on or near the water courses.

I may say there is no uniform system, if any system at all, in regard to the rotation of crops. The arable land is generally divided into two fields, often only one; one is cultivated always in corn, or corn and peas, the other sometimes in oats; though many are prejudiced against oats, thinking they impoverish the soil more than corn, and with such, the field lies idle or grazed until the next year, when it is planted in corn. But few have three fields, and no one more; so that you may judge the improvement is slow, if any; the greater part arises from the decay of the pea vines and the weeds and grasses, which grow after the suspension of the cultivation of the corn crop. The ploughing is generally shallow, to suit the surface soil, 3 to 4 inches deep, sometimes 5 or 6 on better or improved lands.

The land is always broken up with the plough, (Freeborn's cast-iron generally,) then checked off 4 feet square, or 5 by 3, and cultivated with the old fluke hoe plough, or three hoe harrow, commonly called the Eastern Shore harrow, as it was introduced here from thence; which keeps the land level and saves much hand labor. But few ridge, and cultivate one way only, though that system has a few advocates, and I am decidedly one of them. Some few use the double-shovel plough, which is a most effective implement, the best perhaps we have, both in execution and saving of labor, from the time the corn comes up until it is laid by.

The corn blades are always stripped from the stalks, and then the tops are cut, cured and stacked; the corn is gathered from the stalk and housed, as no small grain is to succeed it that fall.

The product per acre is about 15 bushels of corn and 10 to 15 of oats; in some instances more, often below.

Our fences are made of pine rails, crooked or worm fences as they are called, except in a few instances they are wattled or bushed, on a bank thrown up by digging a ditch; cedar boughs are generally used, driving in the banks stakes about one and a half or two feet apart, to weave in the branches, and makes, when care is taken, a very pretty and substantial fence.

Our teams are mostly horses, sometimes a mule or two, and rarely oxen; no horses are raised for sale and but few for farm supplies; calves and lambs are commonly sold in the Norfolk market, and pay better than raising beeves and mutton.

Most of our people are opposed to book farming, and of course to innovations on the old system, and denounce much of what they hear of in agricultural periodicals as humbugs, and hence arises, in a great measure, the low ebb of agriculture among us.

Nearly all the improvements made hereabouts are by those who have been readers of the American Farmer, the Farmers' Register, and the Cultivator.

I regret that I have not been able to give more interest in my reply to the queries submitted by the Board of Agriculture; my occupation is not wholly agricultural, my age too advanced, and travel too circumscribed, to give information entirely correct; if it should be worth nothing, you will of course throw it aside, or glean such parts as your judgment may prompt.

We have no agricultural society in the county, to our shame; there was one in Chuckatuck for a short time three years ago, but so little interest was taken, and but by a few, that it was given up.

I am pleased at the establishment of a Board of Agriculture, and think it calculated to do much good. Respectfully, WILLIAM SHEPERD.

REMARKS ON MR. TURNER'S THEORY ON ROTATIONS.

To the Editor of the Farmers' Register.

Big Lick, Roanoke, June 13th, 1842.

* * * Whilst I have my pen in hand, and am fresh from your Register, I will scribble what has been suggested to me by one of the pieces, which you can use your pleasure in throwing aside or publishing.

In the number to which I allude, the last, you publish the views of J. H. Turner, on rotation, without comment. Are your readers to construe silence into approval? We look to you as a guide, to conduct us along the safest path, when we are perplexed by the discordant and contradictory theories of distinguished agriculturists; and surely if there ever was an occasion when your counsel and warning were required, it was when you gave currency to the views of Mr. Turner. This gentleman, from his successful farming, his zeal for the agricultural interest, and his well written communications, has acquired a distinction which gives more than ordinary weight and influence to his opinions. Of course many, in a spirit of blind confidence, will embrace as the sound and irrefragable results of experience, whatever this practical farmer may advance, however opposed to the lights of science; unless you accompany the publication with your dissent from the errors and fallacies, in which he has involved himself, and into which he is likely, by his specious reasoning, to seduce many of his brethren.

What do you think of the leading idea of his communication, No. 4, "that a rotation of crops is unnecessary?" Is it not opposed to every opinion on this subject ever advanced by yourself? Is it not at war with every principle established by the experiments in vegetable

physiology? Is it not directly in the teeth of all that is taught us by Sir H. Davy, Chaptal, De Candolle, Liebig, Buel, and every other agricultural writer of reputation? And lastly, is it not opposed to the experience of every farmer who does not live within the smoke of a city, where the fertility of his lots may be almost maintained by the continual presence of an atmosphere loaded with gases generated by the filth of a crowded population?

It is a common observation of farmers in this quarter, that when lands are worn down with long continued and severe cropping, so that their yield in *grain* is not worth the labor of cultivation, they will produce a luxuriant crop of *clover*. Not less common is the observation, that old tobacco lots, when they grow tired of the crop which they have borne for a long succession of years, and refuse to produce the same heavily, however well cultivated or highly manured, can only be restored as a tobacco lot by a rotation. It would be easy to illustrate these opinions by many striking examples around me; but I deem it unnecessary to cumber this letter with them, as I presume there are palpable illustrations of their truth in every neighborhood in the state.

We have always thought that these results were perfectly natural, and consistent with the organic laws of vegetable physiology. We have been content with the theory, that some plants require a peculiar species of food, whilst others require a different. That, of course, when the peculiar food of the cultivated plant was exhausted, it was no longer capable of producing it, whilst its adaptation to the growth of other plants, demanding a different *pabulum*, was unaffected. We have always believed, too, that the excrementitious matters, thrown off by plants, were as incapable of nourishing plants of the same kind, as the excretions of animals are of being assimilated by the same species. We have believed, too, that the analogy is farther maintained in this, that these excretions may nourish other plants, differently constituted, as the excretions of one species of animals affords nourishment to another. Such have been the opinions of all enlightened agriculturists for a great many years; certainly ever since the theory was revived and illustrated by the genius of De Candolle. Liebig, in his great work on agricultural chemistry, maintains it, with some slight modification, in all essential particulars. He thinks that the excrementitious matters suffer various transformations in their passage through the organism of the plant, (pp. 54 and 55,) till at last, being capable of no further changes, they are separated from the system, by the organs destined for that purpose. That these exudations, though they may be absorbed, can never (until decomposed) be assimilated by the plants producing them, while they may very well be fed on by plants differently organized.

Independent of the cogent inferences from the known principles of vegetable physiology, in support of this theory, the experiments of Macaire Princep, alluded to by Liebig, seem to place its correctness above controversy. How will Mr. Turner, except upon the principles here advocated, explain the fact that plants of the *leguminosæ* family, wither in the water in which the same species have grown until the excretions have colored it brown, whilst corn plants grow vigorously in the liquid, and the brown color diminishes sensibly with the growth of the plant.

You will observe in this experiment, that the plants selected are unlike in their organism, and whilst the one feeds largely on the phosphates, the other requires scarcely any. I ask Mr. Turner if the inference is not irresistible, that the beans first grown in the water, had destroyed its fitness to sustain a second crop of them, either by exhausting the peculiar food on which they fed, or by *poisoning* the water with their excretions? It is not equally clear, that at the same time that the liquid was thus rendered unfit for the support of beans, it still retained a capacity for producing corn, and that this corn, instead of rejecting, actually fed upon the exudations of the beans? If true, as is proven, with regard to the *water*, I would again respectfully ask your intelligent correspondent, would it not be equally true of the *soil?* Can there be any difference, when every thing absorbed by a plant from the soil must necessarily be previously dissolved? I am sure he will at once admit that the second fact is a legitimate corollary from the first, and in so doing his own theory loses its foothold, and falls to the ground. If this experiment were not so perfectly conclusive, it would be very easy to pile proof upon proof, "Pelion upon Ossa," in support of it.

Liebig relates an instance of a landed proprietor in the vicinity of Göttingen, who, to obtain potash, planted his whole farm with wormwood. The consequence of which was, that it so effectually exhausted the potash in the soil, that it was incapable of bearing grass for many years—the grass requiring a large supply of the silicate of potash.

In combating these universally received opinions, Mr. Turner sets out, rather ominously, in the midst of a strange confusion of technical terms, and an entire misapprehension or misapplication of authors quoted, and when he has thus, under the delusion of an honest zeal for his theory, dove-tailed an ingenious and plausible argument, he then endeavors to varnish over the whole with some striking facts.

In adverting to this part of Mr. Turner's essay, I will not confine myself to his precise language where it is unimportant, as it would unnecessarily lengthen what I have to say, but merely quote the substance.

He says there is one ingredient which is necessary to all crops, and that ingredient is *fertility;* and that this ingredient is just as necessary to one crop as another. *Fertility*, as understood by him, is synonymous with humus, as understood by Prof. Webster, geine as called by Prof. Dana, and ammonia as maintained by Liebig. He makes, in confirmation, an extract from the second report on the agriculture of Massachusetts, whereof Prof. Dana says, "If we can induce the state of geine best fitted for each plant, then adieu to the doctrine of the necessity of a rotation of crops." Without quoting farther at present, let us halt and review the ground.

That this *fertility* here referred to, and easily comprehended by every farmer, is not, as Mr. Turner supposes, synonymous with humus, geine, &c., will be perfectly obvious when it is recollected that many plants, wheat for instance, will not

thrive in pure humus. The word fertility, as used by Mr. Turner, is much more comprehensive. Liebig states that, in many parts of Brazil, where the soil is particularly rich in humus, wheat will not thrive, and in many parts of Europe, where they have formed soils of mouldered wood, [pure humus,] it has been attended with the same result. The stalks attain no strength, and droop prematurely. The cause assigned is, that the strength of the stalk is due to silicate of potash, and that the grain requires phosphate of magnesia, neither of which substances a soil of humus can afford. Liebig adds that wheat will not flourish on a sandy soil or a pure calcareous soil, (*e. g.*, the bald, calcareous prairies of Alabama,) unless it be mixed with a considerable quantity of clay. These soils are deficient in the alkalies, which are indispensable constituents of wheat, while potash and soda are universally present in clay.

But Professor Dana says, "if we can induce the state of geine best fitted for each plant, then we may bid adieu to the doctrine of the necessity of a rotation of crops. This may be true, but the very condition on which it is made to depend destroys its applicability, as used by Mr. Turner. "*If we can induce the state of geine*," &c., is the language of the author. But how induce it? Geine or humus, or to be more specific, the decomposed organic matter of the soil can only be brought to the state necessary to give vigor to the growth of plants indiscriminately by the presence of alkalies. Humus is not soluble in any useful degree in water, requiring as it does two thousand five hundred parts of water for one of humus, while it is readily soluble in alkalies. If then you can always have the requisite supply of alkalies present, you at once induce that state of geine so much desired by Prof. Dana. But can any practical mode be devised of effecting this, other than a judicious rotation of crops, which will feed successively on the different constituents of the soil, and give to the great laboratory of nature time to restore what has been taken away?

But Mr. Turner, feeling probably the weakness of his argument, and the inconclusiveness of his authority, endeavors to sustain himself by a few isolated facts. It seems to me, however, that little weight should be given to these few straggling examples, ("*rari nantes in gurgite vasto*,") which his industry has picked up over our extended country, against the proofs of philosophical investigation, and the almost unanimous testimony of enlightened farmers in every quarter of the world. It is an old adage "that a single swallow does not make a summer," and my Lord Coke says, that exceptions to a general rule, instead of weakening, prove it. The most striking example relied upon by Mr. Turner is that recorded by Mr. Colman, the Massachusetts commissioner, who says, that he saw a rich alluvion field on the Connecticut river, the proprietor of whtch told him that without any manure it had continued to produce good crops of wheat for thirty years in succession. This you will observe is a piece of intervale land on the borders of a stream whose low grounds are of remarkable fertility, and whose inundations annually, or at intervals of several years, may have deposited new soil, and thus maintained its capacity to produce the same crop. The Nile, the Po of Italy, and many of the principal rivers of France, have long been employed as fertilizers of their low lands, and wherever they have been able to irrigate them, they exhibit the same capacity for production with the example cited by Mr. Colman. The most important alkalies always abound in such lands. The overflowing waters, too, hold oxygen in solution, and are thus enabled to act promptly and effectually in producing the putrefaction of the excrementitious matters contained in the soil. But, Mr. Editor, I did not take up my pen with the view of discussing this question with so skilful an antagonist as Mr. Turner, but merely to draw your attention to the subject, that you may enter the lists, and allow me to retire. This letter has insensibly grown to so inordinate a length, and so contrary to my intentions, that I feel that I almost owe you an apology for troubling you with it. When I had once embarked I found all my efforts to regain the shore fruitless, until the present moment.

Yours respectfully,

WM. M. PEYTON.

P. S. Allow me to add by way of postscript. In the same number of your Register, containing the article commented on, I observe, in a very sensible essay addressed to the Board of Agriculture, by Mr. Noel of Essex, an allusion to a universally conceded fact, which is in confirmation of what I have written, and of course in conflict with the theory of Mr. Turner, viz.: that a new peach orchard will not flourish on the site of an old one. He says, in his absence the holes which he had dug for an orchard were filled with the rich dirt taken from the sites of the decayed trees of an old one; and he seems to have viewed it as so palpable a blunder, that he goes out of his way to exculpate himself from any agency in it. I will here add, that I hope Mr. Turner will appreciate the frank spirit in which these strictures are made, when I add that I have read his agricultural essays with pleasure and profit, and that I hope he will continue to shed his light among his brethren.

W. M. P.

Editorial remarks.

We had supposed that, to so long continued and attentive a reader of the Farmers' Register as Mr. Peyton has been, it could not have been a matter of doubt whether our silence, or omitting to deny or object to the opinions of correspondents, implied assent and confirmation. We have had frequently to reply to the like question; and have always answered that our correspondents were free to present their opinions, however different from our own; and that we neither deemed it incumbent on us, or requisite, or even proper and justifiable, to offer editorial comments and objections to every opinion or statement in which we did not concur. If such had been our duty and usage, perhaps such comments and protests would have amounted in bulk to half the size of the articles commented on; and, after all, our opinions would have been worth no more than those which very many or all other observant agriculturists could as well form without our suggestions. It

was only when particular circumstances made it seem necessary and proper, that such editorial comments and objections were made—and then to no greater extent that was deemed requisite. But, independent of offering opinions thus particularly applied, there certainly has been no lack in the Farmers' Register of the expression of our own views, on every disputed and important question on which we supposed it in our power to throw light. And among such questions, there is scarcely one on which our opinions have been more frequently and decidedly given, than in favor of the propriety and necessity of changes and rotations of crops on proper principles. Therefore, as well as on the more general grounds above stated, it was not deemed necessary to reply editorially, to what we certainly deemed the "heterodox" doctrines of Mr. Turner, in opposito the necessity of changes in the succession of crops. Moreover, we had no doubt that some other would come forward, to oppose the views of Mr. Turner on this head, as Mr. Peyton has done, whose experience and ability would leave nothing to regret, because of our silence.

There was another reason for our being silent in this particular case. Mr. Turner came into the lists like a knight challenger of ancient times, slowly and sluggishly indeed as *Le Noir Faineant*, but also like him armed cap-a-pie, and seeming even to court the blows of opponents. His defiance was universal, and his ready lance seemed to threaten every quarter. Believing that he could not fail to arouse plenty of opponents on various grounds of contest, we were therefore the more willing to keep out of the *melée;* and more especially as being already engaged to oppose him upon one particular ground of controversy which could not be avoided, and in which we had endeavored to maintain our ground just before receiving Mr. Peyton's implied rebuke for our backwardness in the present question.

However, having been now thus called on to speak, we will add a few views on a different ground from that which Mr. Peyton has taken. He has occupied, and maintained well, (though we could not sustain him in every position,) the theoretical and scientific argument for rotations of crops. We will merely advert to a few detached facts, and matters of practice, without regard to theory, or to scientific reasoning.

Mr. Turner has quoted, as proof to sustain his opinions, the facts reported to him by several persons, that they had cultivated some one or other particular crop for several or many years in continued succession on the same ground, without deterioration of product, or only such deterioration as was caused by the decrease of fertility, caused by such exhausting tillage. The fact that any person had persevered in so injudicious a course for any length of time, and without learning his error from experience, would show him to be so injudicious a farmer as would alone bring his testimony into doubt. We are very sure that Mr. Turner will never have such proofs to offer from his own practice. But admit all the facts alleged by his informants of their success, and what do they amount to? Why, merely that, as in thousands of other cases, particular facts have contradicted, or have appeared to form exceptions to general rules. And if such apparent exceptions are to be admitted as serving to discredit general rules, then there is no one rule of good farming that cannot be so opposed, and its utility or necessity put down by the authority of facts. We have heard of cases as well established by testimony as those stated by Mr. Turner, which, if deemed conclusive, would as clearly prove that manuring land did no good to the crop—that purchasing and applying rich town manures brought the neighboring farmer to loss—that marling was injurious to land, &c. In short, there is scarcely any one agricultural opinion, however false and even ridiculous, that has not been sustained by one or more *facts* alleged by honest and veracious though certainly mistaken witnesses. And these particular exceptions referred to by Mr. Turner, however apparently successful and profitable, have never been considerable enough, or long enough continued, to cause any general practice to be founded on their example. No farmer, good or bad, has adopted, as a system of cultivation, the continuing the same crop on the same ground every year. There are many different rotations of crops pursued in Virginia, some few of which are good, or established on sound principles, and very many are decidedly bad and very objectionable. But, whether the rotation be right or wrong, every cultivator aims at some rotation, or change of crops, instead of continuing one alone in perpetual succession on the same ground. But universally as is rotation thus approved by practical cultivators, perhaps such testimony may be objected to, (as might many other general practices,) become of the ignorance of most practical cultivators, and the theoretical and visionary views of the more learned. Therefore, we are content to put aside all such authority, and to abide by the practice and experience of only one intelligent, observant, practical and successful farmer; and the credibility of that witness shall

be beyond all doubt or cavil—for we shall summon as that witness Mr. Turner himself.

If no change of crops be necessary, why does Mr. Turner follow corn by oats, and oats by grass? If there be no necessity for, or superior profit in this succession, why not as well reverse the order of these crops, or keep corn always on one field, oats on another, and grass on the remainder of the farm? If the answer be, that although corn might well follow corn, and oats follow oats, yet that the corn tillage cleans and prepares the ground for the growth of oats, and that the oats shelter the young herds-grass and clover, this explanation is, in fact, yielding the whole question, and stating good and sufficient reasons for the particular succession stated.

Mr. Turner's rotation is uncommon, and even peculiar. Still it is not therefore less a rotation; and, according to his peculiar position, we had given him credit for having adopted a rotation of very valuable features and effects. We especially admired the plan of two successive crops of corn, (though a different kind of hoed crop might have been better in place of one of them,) though such a repetition might have been a barbarous and abominable part of a course of crops at ten miles from a town, or where no putrescent manure could be obtained other than the farm furnished. With Mr. Turner, grass for hay is the most important and profitable market crop. Oats is the next in importance, and corn is not worth raising for sale, and only desirable for bread, and as a cleansing crop to prepare the fields successively for grass. To make the most of this cleansing operation, and because he can make up by purchased manure for the double exaction from the field, he cultivates two crops of corn in succession, and thereby makes the ground as clean as possible. Still herds-grass and clover would not take well immediately after corn; the shade of oats is required as shelter from the sun, and even the exhausting power of oats, to keep down weeds, and when reaped, to leave the land wholly to the young grass, when nursed to an age to be able to withstand both sun and weeds. The land then remains several years in grass, until weeds have gained the ascendency; when the crop and tillage of corn again are resorted to, for the purpose of recommencing the same rotation. We merely here present reasons, and aim to show that Mr. Turner not only uses a rotation, but one founded on sound principles, according to our views of the theory of rotation. The practice—the facts—the merit of the system—are all his own; and we have so much respect for his excellent practice, in this respect, that we are content to rely on it alone to rebut all his arguments against the necessity of rotations, even were his witnesses, and particular facts of exceptions to general rules, ten times as many and as cogent as they are.

Mr. Turner has been singularly unlucky in one case adduced as practical proof of there being no necessity for a change of crops. In this case Nature is the cultivator, and her farm "is the world, and the crops are the immense forests with which it is covered"—and Mr. Turner adds, "here too is no relief from rotation, for the same crop has been on the land for thousands of years." (p. 322.) Now the actual facts are directly the reverse—and so striking, that they have been often cited by writers as proofs of the necessity of changes of growth. The ordinary growth of a forest, even at the same time, is far from being the same crop. There are many different trees, as different in kind, and in their habits and wants, and products of manure by their decay, as the different kinds of cultivated grains and grasses. Therefore, even though the composition of a forest might appear to be unchanged in general, for thousands of years, yet it probably is the case that entire changes are perpetually made in the death and replacing of each tree. For example, a pine may occupy its place for a century, and then die, and be succeeded, not by another pine, but by an oak, which may stand for five centuries, and then be succeeded by a beech or poplar. But Nature is not satisfied with this gradual change and rotation by mixing crops. When fires, the depredations of insects, inundations, or tillage, have completely destroyed a forest growth, another succeeding growth is generally of trees entirely different. Thus, if a forest principally of oak, short-leaved pine, hickory, dogwood and chinquapin, in lower Virginia be cut down, and the land suffered to grow up again, (either early or late,) the next growth of trees will be almost exclusively of pine, and that of a different kind (the "old field pine,") from those which formed part of the previous cover. This is a fact notorious to every resident of this region. In other regions the changes of kind are different, but not less marked than these. And so complete have been such changes, and such totally new growths of trees produced, that many persons, and even some men of science, have thence believed in the spontaneous production of such new growth, or equivocal generation of the new trees, because they could not conceive whence their seeds had been derived. Such facts and proofs, directly opposed to Mr. Turner's position, are too numerous to be cited here. The subject is however curious and

interesting, and may be resumed hereafier in a distinct and substantive article.

In sundry of the particular positions assumed by Mr. Turner as proofs, or steps in his argument, we entirely concur, and suppose that no one would dispute. For example—it is not our opinion, nor the opinion of any reasonable advocate for rotation, that the mere growth of any crop serves to enrich the land producing it—or that any rotation of crops, if all are removed, can increase fertility. Nor would we dispute that some *tilled* crops, as corn, cotton and potatoes, (the very cases adduced by Mr. Turner,) may each be continued for many years on the same ground without very manifest deterioration, especially if dressed by various kinds of manures. But the true question is, could not, even in the most successful cases, these crops have been raised better, and to greater profit, if alternated with others? But even the admission of such exceptions cannot be made as to *broad-cast* crops, which are not cleaned by tillage. It is manifest and notorious, that neither wheat nor oats, nor any one kind of grass, can be continued to any profit, for years in succession on the same ground. Mr. Turner's statement of his own herds-grass giving place after a few years to green-sward, or to weeds, is not only a proof of this position, but also of Nature's urgent demand for a change of crops.—Ed. Far. Reg.

LIME.—THE WHEAT CROP, &c.

To the Editor of the Farmers' Register.

I lament, my dear sir, that you should think of giving up your useful labors; believe me when I assure you that the Farmers' Register has been a great public benefaction, and I must hope that you will not discontinue it. If you would be contented to take the vote of Virginia as your guide, I am sure you would have an overwhelming vote to go on. Men may differ, and do differ on every subject; from the hour that "darkness dwelt upon the face of the deep," man has dared to differ with his God, how then could you hope for agreement and sympathy? You have been his benefactor; what of that? Is he not in a free country, to take such things as he does, and his neighbor's grounds, and use them according to that barbarian thing called the "enclosing law," or "act of assembly." If a people be legislated into barbarity, why complain of them if they have not the fear of God upon their minds?

I owe much to your correspondents for amusement and instruction, and I would not on any account offend the least of them: let me, in this feeling, give you a few facts.

I have used, in the last twelve years, seventy thousand bushels of lime, with full and complete success. If I say the crops have been doubled, I am within the bounds of truth, save in two previous crops of wheat, which were failures. The present is very great, and I impute it to the difference in cultivation; the failures were after three and four ploughings, the present after one only. This however is the ninth day since I began my harvest, and I have not, from rain, cut twenty acres. A few days more of such weather must sprout it all in the field.

My corn is fine, and that for twelve years or more has been planted upon one ploughing; it is then coultered twice, and the cultivator finishes. But let me add that 8 cultivators pass over my field in four days, and I am persuaded that I get more from the atmosphere than the corn uses in its growth. For this reason I call it my chameleon crop, and feed it freely.

My oat crop upon limed land is not slow to show the power of lime. My clover, sir, is the food, the meat and drink of all other crops. I save my own seed, and sow in the pug, twenty bushels to the acre, as clean as the hand rake will make it from the thrashing machine, and that is as little as we give. This gives dear old Mother Earth a perfect robe of green; and when the blossoms set, it takes no poet's imagination to see that the dear old lady is in a dignified strut. I never fail to give one or one and a half bushels of plaster in March; and say what you may or please about philosophy, plaster upon limed land is worth six times its weight in fine flour upon your table. I forgot to say that I put a spoonful of plaster to each hill of corn as soon as it is planted, and that I plaster my meadows every spring with full and entire satisfaction as to results. Lime—lime—lime.

Fairfax county, June 18th, 1842.

THE WHEAT HARVEST

Has just been finished, or is about closing, on every farm in this region, and the result is certainly very far below the recent anticipations of an uncommonly abundant crop. Rust struck the crops, almost universally throughout eastern Virginia, but a few days before the wheat was fit for the scythe, which alone would have lessened the product very considerably. But added to the always disastrous effects of this worst disease of wheat, rains fell almost every day throughout harvest, and sometimes in immense quantity, so as to damage all other crops also, and especially the cultivated lands, by flooding and soaking the level, and washing the hilly surfaces. From Monday, the 13th, when the harvests here commenced, there were 10 or 11 rainy days, and only one day in which rain did not fall (Sunday, 19th); and during that time, nearly all the crops were reaped, and greatly exposed, and more or less damaged, or wasted by the necessarily hurried and bad work under such circumstances. Many of the shocks are yet wet, and require to be taken down for drying. No farmer can yet estimate his own loss, with any approach to accuracy, and of course a general estimate must be very uncertain. But the general loss cannot be less than one-fourth of the whole crop of eastern Virginia, as it promised a few days before ripening. We have passed through and seen crops of seven counties during harvest. No certain information from the mountain region has yet been received. The last rains were on the 25th, and since the weather has been fine. On the level lands of Gloucester, and still more of Mathews, great loss was counted on even in the oat crops, from excess of wet; and also to the corn crops, because of their foul state, and the long time before the ground could be again ploughed.—Ed. F. R.

June 29, 1842.

From the Dumfries Herald.

A NEW SOURCE OF THE BEST MANURE.

"Ne saturare fimo pingui pudeat sola; neve
Effetos cinerem immudnum jactare per agros."
VIRGIL.

In cold and temperate climates, the value of farm-yard manure has been known from the earliest period. It contains, or it leads to the formation of, every ingredient which our field crops demand from the soil, and it gives off its riches gradually as they are needed.

But it has always been a difficult matter to obtain this in quantity sufficient for the wants of a hard-cropped soil. The demands of our increasing population proclaim its inadequacy. The labor of cartage draws deeply on the farmer's funds; and the want of more portable manures is now extensively felt.

Bones, charcoal, burnt clay, and various salts, have, in turn, presented their claims. But of all the substitutes for farm manure yet proposed, none has claims so extensive and well founded as those of *wood ashes*. These already contain nearly all that plants draw from the soil. On warm soils, they so powerfully dispose the formation of ammonia and nitrates, that they render the addition of dung almost needless. They promote the disintegration of the soil, accelerate vegetation, and require little cartage.

The chief difficulty, as yet, has been the scarceness of the article: and my object at present is to point out the source of an abundant and cheap supply, for the wants of at least the present generation—*a supply which may be the means of adding to the wealth of Britain, doubling her produce, enriching her colonies, relieving her surplus population, extending her dominions, meliorating climate, and doing hurt to none.*

Our countrymen who emigrate to Upper Canada, find vast forests which they would more actively remove, if they had a remunerating price for their labor. By them, much of our pearl ash is supplied. They burn the wood, collect and lixiviate the ashes, evaporate the ley, and sell the "*black salts*" to purifiers, who present them to us in the form of pot or pearl ashes. Their methods at present are said to be clumsy, and their matters imperfectly collected; yet some of the more enterprising clear 20 acres annually, and pay all their expenses from the sale of their black salts. But, as many leave the ashes unheeded, where the wood is burnt, it seems that the supply is easily made to equal the present demand.

Now, sir, if a greatly increased demand were made, not perhaps for black salts, but for well burnt ashes, the labor and expense of lixiviation and purification would be spared, and an article better suited to the wants of the farmer would be obtained at a very moderate price.

It may safely be assumed that a ton of ashes is wasted for every hundred weight of good pearl ash which reaches this country. The increased carriage and freight would certainly be more than compensated by the want of trouble in purification, and hence we might have the ashes for 2s. to 2s. 6d. per cwt.

Eight hundred weight of these, per imperial acre, mixed in a little farm manure, would be quite enough for a five years' rotation. I have no doubt but that *six* hundred weight of these ashes, judiciously mixed, under cover, in six carts of good dung, will, in raising a turnip crop, be found equal to 30 bushels of bones, and will leave the ground as fertile. As every farmer can easily, on his own farm have more dung than he thus needs, his whole cash outlay for manure will be only 12s. to 15s. per imperial acre, instead of 90s. when he uses bones; and the difference of labor will be very trifling. On the second grass crop, the addition of other two-hundred weight of the ashes would *amply* pay the expense.

Let men of capital and scientific acquirements remove to Canada, and employ poor people in cutting and burning the wood, and clearing the ground. This will employ many who cannot now find work. The ground cleared, will require people to cultivate it. Roads will be improved. Our Canadian colony will rapidly grow in value and importance. An increased market for our exports will be opened; and the same trade may be extended to our other colonies, where wood abounds to a hurtful extent.

The guano trade must end in disappointment. The bone trade sends the money of the British farmer to enrich the nations of Northern Europe; but the Canadian ash trade, will enable the Britons to put money out of one of their pockets into the other.

Nothing truly valuable is effected without some difficulty; and I merely throw out the suggestion, that better-informed minds may digest a working plan. The bulk of the ashes may be objected to, and some method of concentrating them may be devised. But while I know that trees contain too little silica for corn plants, I believe that the value of the ashes would be diminished at least one half, by the removal of silica.

We have lately heard of our government encouraging colonization. I hope their attention will early be directed to this matter; and I am, your obedient servant, P. G.

NEW ARTIFICIAL MANURE.

From the New Genesee Farmer.

We have seen, in several English publications, notices of a new manure invented by Mr. Daniell. The following account of it, given to the Royal Agricultural Society, we extract from the Boston Courier, a paper always alive to the subject of agricultural improvement, which quotes it from a London paper. We subjoin a letter on the same subject from our intelligent correspondent at Boston; and shall give, at the earliest opportunity, any farther information which we may obtain.

"It had long been a subject of inquiry, what is the food of plants, how are they supplied and what are the elements of their growth? There was every reason to believe that a reply could be now given of a more satisfactory nature than had ever been hitherto known; besides which, by the discovery of Mr. Daniell, a most important corroboration had been obtained of what had been considered the elements of vegetable growth; those elements were carbon or charcoal, hydrogen or inflammable gas, oxygen or vital air, and nitrogen. All these elements existed in the atmosphere, in combination with other elements, in which state they were found to be the sources of

vegetable developement. It was known to persons accustomed to rural pursuits that the heaps of vegetable substances collected for the purposes of manure, during the process of decomposition, became greatly reduced in bulk and weight. If they investigated the causes of this reduction they would find that it was occasioned by the evaporation of the carbonic acid and ammonia, the principal sources of nutriment to plants. The discovery of Mr. Daniell contained all the elements of vegetable growth. It did not supply new elements, but the same derived from other sources. It was known that by combustion substances were rapidly decomposed, and its operation produced the elements of vegetable growth. There were on the earth numerous plants which were apparently useless, but it was a principle in nature that nothing should be lost, and they were capable of a reduction into their elements, and being made the means of vegetable growth in other forms. The discovery of Mr. Daniell was suggested by the fact that, while burning vegetables, he observed that the ashes became blackened by the surrounding smoke, and when used in that state were very fertilizing. This led him to investigate the cause, and as the result of his investigation he had produced the new manure, the elements of which were carbon and ammonia. With it the principal properties would not fly off during decomposition, as that would take place in the earth. Among other advantages, it was light in weight, cheap, and capable of being produced in any quantity.

"This manure has been applied by the discoverer to his own crops, on three acres of poor land, in an elevated situation, on some of which he has grown wheat four successive years with improving results each year; its good effects are therefore founded upon experience, personal observation, and the testimony of other observers competent to judge. From the nature of the manure, it is applicable, with some variations in its composition, to every kind of crop. It is not a stimulating manure, in the ordinary sense of the word—that is, it will not have a tendency to call into activity the existing resources in the soil—but its direct effect is to convey to the soil the direct nutriment of future growth. This effect is produced by the supply of ammonia to the soil in substances calculated to retain it for a time—to again absorb it from the atmosphere—as they give it out to plants during their growth. It will probably prevent also the ravages of insects. Its mode of application may be various, according to the circumstances of the crops. The application by drill is conducive to economy of the manure, and a direct application to the infant plant as is the case with bone dust. Care, however, must be taken that it is not applied too directly to the plant, or without some portion of mould around it. This is the only precaution needed to avoid danger in its use. There is one required to prevent waste, as it is of a volatile character; that is, to place it several inches in the earth, as the earth will absorb and retain the volatile and valuable part. For grass lands, for similar reasons, it will be well to have it mixed with a considerable portion of ordinary unvalued mould. If the manure, as manufactured, be mixed with an equal bulk of mould, it will be perfectly safe for application; or if the mould of the field be stirred over it when drilled it will suffice. The quantity to be used will vary according to the crop, like any other manure. About twenty-four bushels per acre are recommended for wheat, and half as much more, or thirty-six bushels, might be beneficially applied for turnips or mangel wurtzel. The most beneficial quantities will easily be ascertained by the intelligent farmer."

Mr. Hall produced a sample of the manure—a coarse black powder, having a strong smell somewhat resembling coal-tar. Samples of the wheat grown by Mr. Daniell were also exhibited, and it was stated, in reply to questions, that the crops produced were greater in quantity, better in quality and weight, and produced with one-third the ordinary quantity of seed. The manure will probably be about one-third the present price of bone dust.

NEW ARTIFICIAL MANURE.

From the same.

The knowledge of the ingredients of the celebrated artificial manure of Mr. Daniell, has at length reached this side of the Atlantic. They are as follows:

Any wood mechanically reduced to powder—in plain words saw-dust—this is the basis, and it is to be thoroughly saturated with bituminous matters of all or any kind—to this is to be added small proportions of soda and quick lime, and a very small quantity of sulphur.

The principles on which this compound is formed appear at first rather obscure, but one thing is apparent, it is an attempt to make an artificial bituminous coal and to keep this in a state of slow combustion with only the substitution of soda for the potash of the wood and the addition of quick lime. We are not told the proportions, nor how long the compost is to remain before used, nor what the bituminous matters are; the only additional information is that it should be buried two or three inches under the surface of the soil.

Before I proceed farther with an analysis by reasoning of this new artificial manure, I must lay before you well authenticated proofs of the value in agriculture of the products of the combustion of bituminous coal.*

Bituminous coal contains from 13 to 16 per cent. of nitrogen or azote, and 4 to 12 per cent. of hydrogen—when the coal is burnt, these two gases unite and form ammonia—when burnt in the open air the ammonia goes partly into the atmosphere and is partly condensed in the soot. When it is burnt in retorts for the purpose of affording gas for illumination, the ammonia is dissolved in the liquor used for purifying the gas, and is called the ammoniacal liquor of gas works. According to Mr. Blake of the Boston gas works, 1 chaldron, or 2700 pounds, gives 33 gallons of this liquor, containing 5 per cent of ammonia, and 24 gallons containing 4 per cent—but the strength of this

* Turner's Chemistry gives the following proportions of nitrogen in 100 parts of coal:

	Caking coal.	splint coal.	cherry coal.	canel coal.
Nitrogen	15.96	6.25	10.22	13.72

There is much reason to suppose that these amounts are considerably overrated.

liquor generally varies in different and also in the same gas works.

In the Gardener's Chronicle, 2d of April, 1842, is a detail of the following experiment made with this liquor :

A large quantity of this ammoniacal liquor was tested for its strength—it was found that it took 5½ pounds sulphuric acid, containing 65 per cent. dry acid, to neutralize 87½ lbs. liquor. It was then divided into four parts—in the first the ammonia was neutralized by phosphoric acid, forming phosphate of ammonia—the second with sulphuric acid, forming sulphate of ammonia—the third with nitric acid, forming nitrate of ammonia—the fourth with muriatic (hydro-chloric acid) forming muriate of ammonia.

Each of these solutions were so mixed with these acids, that the quantity of ammonia in each was the same ; they were much diluted, and half a pint of this dilute solution was given to each plant every other day. Thirteen experiments were made with 25 cabbage plants each. The weight of the cabbages, taken up in the autumn, was as follows :

No. 1. Liquor neutralized by phosphoric acid, to which was added 300 grains of a mixture of sulphate and phosphate of lime. 103 lbs.
No. 2. do. by sulphuric acid and the same mixture, 99 lbs.
No. 3. do. muriatic acid do 73 lbs.
No. 4. do. nitric acid do 65 lbs.
No. 5. do. with carbonate of ammonia dissolved, leaving the same amount of ammonia with the earthy salts, 58 lbs.
No. 6. do. with phosphoric acid but no sulphate or phosphate of lime, 62 lbs.
No. 7. do. sulphuric acid do 39 lbs.
No. 8. do. muriatic acid do 29 lbs.
No. 9. do. nitric acid do 23 lbs.
No. 10. do. carbonate of am. do 12 lbs.
No. 11. do. with dung alone, 37 lbs.
No. 12. do. without dung, 23 lbs.
No. 13. do. Poitevin's dried manure, 40 lbs.

Here No. 5 and No. 10 are useless or perhaps worse,—carbonate of ammonia already existing in the liquor, and the addition of more only rendered the solution perhaps too strong, to the injury of the plants, as the result shows.

In No. 56 of the Scotch Quarterly Journal of Agriculture, is an account of 4 acres grass land put under experimental cultivation,

1 acre with 112 pounds saltpetre,
1 " 168 " nitrate of soda,
1 " 560 " rape dust,
1 " 105 " gal. ammoniacal liquor.

The strength not mentioned, but diluted with five times the quantity of water.

The acre with the nitrate of soda exhibited the earliest luxuriance of vegetation.

That with ammoniacal liquor the next, but this soon surpassed all the rest.

That with rape seed showed the effect the latest, but improved greatly as the season advanced.

The produce from 31 square yards of each was, in weight of grass—

With saltpetre, } nearly the same, averaging 98½ to 100 pounds.
" nitrate of soda, }
" rape dust, }
" ammoniacal liquor, 126 pounds.

When made into hay under equal circumstances, on the 2d of August, the result was—

with saltpetre, 31 pounds,
" nitrate of soda, 32 pounds,
" rape dust, 30 pounds.
" ammoniacal liquor, 46 pounds.

In experiments with other substances as manure, the product with ammoniacal liquor always exceeded considerably the rest.

These appear decisive experiments, as to the great value of the ammoniacal liquor produced by the combustion of bituminous coal. If, therefore, this new manure will give us an artificial bituminous coal, which will of itself enter into slow combustion and furnish vegetables with this ammoniacal product by degrees as wanted, it must be of immense value to agriculture ; and in truth this operation will have to be judged of by observation of its continued effects as much as by those of its immediate action. The value of bituminous soot as a manure has never been doubted ; but like many other manures, it has too often been applied in such large quantities or in such strong solutions, as have rendered it injurious instead of beneficial. The farther consideration of this new manure I will, however, leave until my next letter.

J. E. T.

THE INFLUENCE OF THE ORIGIN OF SEEDS ON THE QUANTITY AND QUALITY OF CROPS.

*By Dr. Bronn, Professor of Rural and Sylvan Economy in the University of Liege.**

[Translated for the Farmers' Register, from the *Journal d'Agriculture, etc., des Pays Bas.*]

Even to the present day, the cultivators of forest trees have not thought of taking advantage of a phenomenon which is presented to us in the cultivation of agricultural plants, and which, although it has never yet been sufficiently explained, is nevertheless well established. This phenomenon is the influence which seed exerts on the quantity and quality of the crop which is produced from it, according to the different nature of the soil and climate from which the seed has been procured. The good results of this influence have appeared after using seed from a cold climate and a tenacious and cold soil, in a warm climate and a dry and light soil ; but they are also equally apparent under circumstances quite the reverse, provided the soil be not too dry and barren, and the seed has had the opportunity of being developed and coming to perfect maturity. It appears then that the two opposite kinds of soils and climates profit equally from a change of seed. Let us consider and examine at first a few observations which may serve to explain this phenomenon, and thence endeavor to deduce the physiological law, and apply it to the cultivation of trees.

The advantages resulting from a change of seed are generally recognized in the cultivation of the

* Professor Bronn's article is here republished, in obedience to the request of one of our most valued correspondents, made in the early part of this volume. It now receives additional value from the remarks appended.—Ed. F. R.

cereal plants. In some mountainous countries, in Scotland for example, they bring the seed from the low country and from the plains, where the climate is more mild, and consequently the seed more forward, a quality which it always preserves for several generations. We are convinced that the cultivator of this mountainous district, if he always used seed from his own crops, would reap later and later harvests, so that at last perhaps they would not come to perfect maturity; a circumstance easily explained by the short duration of summers in the mountains. If, on the other hand, the cultivator of a flat country, the climate of which is mild and the soil dry and light, continually made use of his own seed, it would head every year sooner, the stalks would become shorter, and the heads and grains smaller and smaller, and in time there would result but a poor produce. In this last case the cultivator brings his seed with advantage from a country more cold, the soil of which is good and substantial. Probably these are the circumstances on which rests entirely the difference between the cereal plants of summer, and those of winter, a difference too variable to be easily determined.

The flax, without doubt, presents us with the most striking example of this phenomenon. We, with great advantage to our crops, bring our seed from Riga, *i. e.*, from a colder climate—the sowing of which causes the grain to be slowly formed, and thus leaves more time for developement of the stalk, which is the principal object of its cultivation. To judge by analogy, we would be led to believe that the result would be the same, were we to obtain from a colder country and a colder soil the grain of the clover and other plants used for forage, in the cultivation of which our object is large stalks and a well developed foliage. Even at the present day we are without experience on this head.

Generally, all plants which are principally cultivated for their grain or fruit, need little or no manure; while manure is necessary for those plants from which we wish to obtain large stalks and leaves.*

Fruit trees which shoot vigorously, generally bear little or no fruit; and every circumstance, which on the other hand prevents the too great growth of wood, favors the formation of fruit. On this observation rests the cultivation of dwarf fruit trees, and espaliers; also that of the vine, &c.

Field plants and plants of the kitchen garden (under equal circumstances in other respects) blossom sooner in dry, warm and clear summers, and their stalks as well as leaves are smaller, than in rainy and cloudy summers.

From these and many other analogous observations, we can deduce a physiological law of the greatest importance in the cultivation of plants, to wit: Every thing which favors the disproportioned growth of vegetables, opposes or retards their propagation or formation of fruit; and *vice versa*, the formation of fruit is hastened and forwarded at all times when exterior circumstances prevent the full developement and disproportioned growth of the stalk.

Now to apply this law to the rearing of trees, I ought first to remark that many of the phenomena which I have mentioned, are equally apparent in the vegetation of forest trees, although they have not been so much noticed. In fact we see the greater part of our forest trees bear seeds sooner, more often, and in greater quantities, with a south exposure, and in a dry and light soil, than with a north exposure, and on a cold and stiff soil; while under the latter circumstances they acquire greater dimensions.

Many trees, the birch for example, vary with regard to the time of budding and formation of seed, some being forward, and others late. It is well ascertained that those which bud late, have the hardest, heaviest, and in every respect the best timber, and increase more in volume within a certain time, than the more forward kind. It is not yet proved that the same phenomena may take place relative to age, *i. e.*, that there may be varieties which blossom and bear seeds, and the growth of which consequently diminishes at different ages. This appears very probable, since we frequently see larches, firs, birches, &c., trees which had their origin in a cold and elevated country, bear seeds in a low, dry and warm country, after having scarcely reached the age of ten or fifteen years, and ten or fifteen feet in height; and the growth of which afterwards becomes sensibly slower.

From this observation we may conclude that the trees of cold climates produced from seeds gathered in dry and level countries will degenerate after many years to dwarf trees, shrubs, bushes, &c. which will scarcely ever be of any value as forest trees. Every attentive cultivator of forest trees will have already noticed similar examples, which will justify this conclusion.

From all that precedes, I deduce for the rearing of timber trees this general law: It is necessary to procure, as far as possible, the seeds from a colder climate, and a colder and stiffer soil, than the climate and soil of the country on which you wish to rear these trees.

One of the best things for cultivation in the sandy lands of the provinces of Limburg, of Anvers, and of Northern Brabant, is undoubtedly the sylvan pine, [*pin sylvestre.*] According to the rule just above, the seed gathered in this dry and barren country should not be used, but ought rather be brought from a colder country, or from some place, the soil of which is colder and stiffer. Since some time back, in France and elsewhere, the preference is generally given to the seeds of the pine from Riga, Norway, Scotland, Haguenan, &c., and the rule which it is my wish to establish, has thus been followed by us, but without our having been able to justify this preference by reasonable motives. We have been content to regard the pines of this country as a particular species or variety.

The fir *epicea* (a northern fir,) and larch, are suitable to be reared in the mountainous lands of Ardennes. If we used the seed which grows

*The author's meaning must be taken with reference to the usual rotations of his country, according to which, crops raised for their seeds, are preceded or followed by grass crops, or others, in which the bulk of the whole plant is of far more importance than the quantity or the perfection of the seeds—and according to his theory, crops of the latter kind would receive so much more benefit from the manure than the former, that economy requires the farmer's limited stock of manure should be given to the one kind, and not to the other.—*Ed. Farm. Reg.*

in the dry and sandy parts of Limburg, Anvers, and Northern Brabant, we would raise nothing but dwarf trees, which at the age of twenty or thirty years, perhaps, would be covered with mosses, and the growth of which would after that become more slow, and would soon afterwards decay. It is our interest then to bring these seeds from still colder climates and better soils, and from countries in which these two trees grow larger, viz.: from the Alps, Switzerland, the Tyrol, the mountains of Hartz, the Black Forest, and Norway.

The rule which I wish to establish will perhaps become very useful in introducing into this country foreign forest trees, for it is very probable that the little success with which we have met in this important part of the cultivation of forest trees is occasioned principally by choosing unsuitable countries from which to bring the seed.

[The foregoing communication well deserves the attention of all thinking farmers. If Professor Bronn's opinion is correct, we may make it operate beneficially on the practice of every farm, either for the correction of common errors, or the introduction of positive improvements, or for both. Very many cases of the proper application of this theory will readily occur, of which I will mention a few only as examples.

We frequently change our seed wheat, either from choice or necessity, and obtain new supplies from other, and perhaps very different soils—and we decide on the comparative productiveness of any two kinds, most generally, by their growth, as they stand in the field. Yet, according to the foregoing theory, the greater length and bulk of straw may be expected from seed that will yield a deficient crop of grain. By attending to the rule offered, we may make profitable selections of seeds from every single field, by taking from the warm and light soil, if we want the best product of grain, or the cold and backward, if the crop is of a kind to be most profitable in proportion to its whole bulk. Another necessary deduction is, that the farmers of lower Virginia ought often to procure new seeds of clover and other grasses from the mountains, or the northern states, to renew the original bulk and value of those crops, and to prevent their becoming more productive in seed than in hay. And the reverse operation will be equally beneficial as to wheat and other grains, of which the mountain and northern farmers ought frequently to obtain a new stock of seed from the plains and from the south. But even if such considerable changes are not attempted, a less degree of benefit may be obtained by attending to these rules within the limits of almost every farm.

A striking proof of the truth of Professor Bronn's opinion of the influence of climate on seeds is presented in the different times of maturing of the timothy grass of America and the cat-tail grass of England. These grasses are in appearance, and in every respect, precisely the same, except that the English grass is about two weeks later in maturing than the American, when both have been sown together on the same soil, Mr. Strickland made the trial, and states the result in his observations on the agriculture of the United States, reported to the British Board of Agriculture. This difference, which was so fixed, and appeared so remarkable to the observers, is completely explained by Professor Bronn's theory, applied to the temperate and moist summers of England, and the more heated air and drier soil of the United States.—Ed. F. R.]

REMARKS.

Professor Bronn's theory on the influence of seeds is, in the main, confirmed by many facts which have come under the observation of the writer of these remarks. Seeds or trees transplanted from northern to southern soils, mature their fruits earlier than the same species not so transplanted; and *vice versa*.

The northern summer is of short duration, and the progress of vegetation is consequently very rapid. Plants in such climates thus acquire the *habit* of quick growth and early maturity; and this habit is perpetuated for several generations in annual plants, and for one generation at least in perennial plants, upon removal to a southern climate. On the contrary, southern plants, having a long period in which to perfect themselves, acquire a slow growth; and this constitutional tendency is manifested in their offspring, when removed to a northern climate.

In the case of fruit trees, the varieties of the winter apple, introduced into Virginia from the northern nurseries, perfect their fruit early in autumn. It falls from the tree before the usual period of gathering, and is therefore of no value for winter use. The summer apples from the north come early into bearing here, and possess desirable qualities.

Nearly all our best varieties of peaches have originated north of us, or been introduced thence from foreign countries. The latest of any merit is the well known Heath, which ripens here about the 15th of September; in Baltimore from the 25th to the last of September; and in New York so late as seldom to develope its superior excellence. Our earliest peaches are also obtained from the north; for we have no native variety that ripens early in the season. The advantages of our climate are such, that we might have the peach in perfection from the middle of July to the middle or end of October; but as long as we depend upon northern sources for this fruit, we can never have any variety materially later than the Heath. Had the system of originating fruits been practised here and south of us to the same extent as elsewhere, it would have been practicable, by making judicious selections from various sources, to have the peach in regular succession, and in a high degree of perfection, for at least three months.

The northern corn, when cultivated in our climate, cannot be relied on to make a crop. The very early varieties, which produce soft corn for the table in July, may be planted for that special purpose with evident advantage. But for agricultural purposes, no variety of northern corn can produce an abundant yield in this climate. The hardening of the grain takes place in the month of August, the most critical period in the whole season. Those who attempted the cultivation of the famous Dutton corn, a few years ago, may recollect how utterly it perished during the heats of summer.

The northern wheat might be introduced here to great advantage. The influence of the seed extends through two or three generations, and the maturity of the crop is hastened by at least several days. Wheat usually ripens by or soon after the accession of hot weather, so that the effect of a change of seed is more beneficial than in the case of corn. While it is desirable to accelerate the ripening of the one, it is far from being so with the other. September is the proper season here for corn to mature.

All *early* vegetables are grown with decided advantage from northern seed. Gardeners who would have the earliest peas, beans, squashes, and other spring or early summer vegetables, do well occasionally to renew their seeds from reliable sources. But by exercising the greatest care in saving the earliest perfected seeds from their own grounds, most varieties may be preserved in their purity for a length of time.

The writer of these remarks has frequently exchanged seeds, both of useful and ornamental plants, with his correspondents at the north, and occasionally with those at the south. He has also received plants from various parts of the country. The facts above stated are derived from actual experience, and they are submitted as a practical illustration of the physiological principles asserted by Professor Bronn. P.

SOWING CORN FOR FODDER.

From the New Genesee Farmer.

Mr. Colman—In the Farmer for March, your correspondent, Ledyard, asks information on the subject of sowing corn, broadcast, for winter fodder. I was, at first, surprised at the inquiry, but on reflection, concluded he must have been a stranger to your paper, probably just then commencing an acquaintance with it. I ask leave, therefore, to refer him to your number for July, 1841, page 109. He will there find an article on the subject, that will, I think, in a measure satisfy his inquiries. I have been for twenty years accustomed to this culture, and have there given the result of my experience. I do not feel as if I could say too much in its favor. The product per acre, on a rich soil, and in a favorable season, will be very great. I have never had occasion to ascertain with accuracy the amount. But have considered, or estimated the amount, on different fields and in different seasons, to vary from five to seven tons, or more per acre. I have carried well a very large stock, rising 1000 sheep, and many cattle, far into January, with very little hay.

I would by no means suffer the corn to stand to let the ears ripen before harvesting. It should be cut when most juicy, when the juice is richest and sweetest. This will be, I suppose, at the time when the kernel has become nearly or quite full of milk. When sown 2½ bushels of seed per acre, the quantity which I recommend, and from which I would not vary, it will stand so thick and the stalks be so slender, that but few ears will set. Cut up at the time I propose, it will be so extremely succulent, that it will need to stand in small stouts to cure, during the dry and hot weather; and should be put into stacks, as recommended in the article referred to above, just before the fall rains commence.

The idea suggested in the Farmer for March, page 34, "that weeds will check its growth, if the land is rich, and fill the ground with seeds," I cannot think correct. It is entirely at variance with my experience. The ground is so deeply and perfectly shaded, that I have found nothing could live or grow among it, save the Canada thistle; and this would shoot up a slender, pale, weak, and sickly stalk, unable to produce or sustain a blossom.

I have been pleased, after taking off the corn, with the condition of the ground for cross-ploughing and sowing with wheat. I recommend to sow corn early, that it may be harvested early, and thus have the full benefit of the dry and hot weather, for the process of curing the stalk. If cut late, it will be more difficult so to cure it as to secure its safety. I once lost a large quantity, supposed well cured, by stowing it away in a large and solid mow. Of course, I prefer stacking it, as recommended in the article referred to above, around a pole, the length of a sheaf only from the pole, so that the butts shall all be exposed to the air. A FARMER.

April, 1842.

SLUGS DESTROYING THE COTTON CROPS.

A new enemy to the cotton planter has made its appearance in Panola and De Soto counties, Miss., in the shape of innumerable snails, which eat up and destroy the plant, commencing with the leaf and ending their repast with the bud. They are apparently the common-sized snail without a shell, such as may be found adhering to the bark of trees in wet weather. Several entire cotton plantations have been ruined by them.—*Compiler.*

This new and most destructive ravager, the naked snail, or *slug*, may be effectually and cheaply checked by sowing a few bushels of quick-lime to the acre, on the fields infested. See an article copied from an English journal, giving full directions, at page 216, vol. ix. Farmers' Register. This is one of the many cases, in which a little book knowledge, as much despised and disregarded as is such knowledge by farmers' and especially by cotton planters, might save hundreds or thousands of dollars to individuals, and millions to the country at large.—ED. FAR. REG.

THE FRUIT GARDEN.

By David Thomas, of Cayuga county, N. Y.

From the Transactions of the New York State Agricultural Society.

In traversing our wide spreading county, the pomologist must observe with regret that so few of the landed proprietors enjoy the luxuries of the fruit garden. The stately mansion, the comfortable farm-house, or the neat cottage, may meet his view in every direction; and well cultivated fields, loaded orchards, and abundant harvests, indicate that plenty reigns within; but if he stop and inquire for the finer fruits of the garden, what answer would he get? In nine cases out of ten, perhaps, their names would sound like the words of an unknown tongue; and the lord of the soil know as little about them as he does of the *lotus* of Lybia, or the *mangosteen* of India.

How many of our freeholders have ever tasted an *apricot*? How many of them cultivate the best *cherries*? How many know that delicious *plums*, always fresh from the tree, may be had from early wheat harvest till the ground freezes in autumn? How many eat the finest varieties of the *peach*? How many think of having "the circle of *pears*?

These questions if duly examined and considered, would show our deficiency—for deficiency, omission, or neglect it must be, not to provide for all the reasonable wants of our families. Now fine fruit in abundance would supply a reasonable want. The relish for it is prevalent throughout every class of our population—from the honored guest who regales on what is set before him, down to the school-boy who stops to plunder by the way.

Hundreds, however, may think, or say, "We have no time to attend to such trifling affairs." This plea might be allowed while a man was struggling to save his property from execution, or his land from the foreclosure of a mortgage: but from him who basks in prosperity, it would come with an ill grace. Every day comforts are not *trifles*. Luxuries which delight the palate, and conduce to health, are not *trifles*, yet well ripened fruits belong to this class; and we are satisfied that much suffering, and many a doctor's bill, might be saved by a plentiful supply.

It may be said indeed, that fruit often causes illness. So grain often causes founder; and cold water often causes death; but it is the *excess* that proves baneful or destructive. Half-ripe, crude, unwholesome fruits have no attraction for him that has free access to the fruit garden: it is the unfortunate wight for whom nobody has planted or provided, that incidentally suffers.

One hundred trees in most cases, would furnish an ample supply for a family, and may be selected in the following proportions:

15	cherry trees,	at 37½ to 50 cents.
8	apricot do.	37½
25	pear do.	37½
15	plum do.	37½ to 50
20	peach do.	25
5	nectarine do.	25
8	quince do.	25
4	early apple do.	25

The common nursery prices are added; and the annual interest on this sum, whether *borrowed* or *appropriated*, would barely replenish a tobacco box through the year.

Now a fruit garden containing this number of trees, ought to yield a constant supply of *cherries* for two months; of *apricots* for one month; of *pears* for nine months; of *plums* for three months; and of *peaches* for two months.

One hundred trees would do well on *half an acre;* but if we allow a square rod for each tree, the fruit garden would only be ten rods square. Now a lot of this size may be conveniently appropriated on every farm; and where is the owner who cannot build forty rods of fence? Let him listen, however; thorny shrubs would afford the best protection—not against quadrupeds, but Plato's "two legged featherless animals;" and the sooner such a hedge is planted the better.

Unfortunately for the moral character of our population, fruit is too generally considered lawful plunder. The culturist is allowed to have a full and exclusive right to his corn and potatoes—it would be infamy to steal them; but no exclusive right to his fruit—if they can get it. Thousands of honorable exceptions to this charge, indeed, may be found, but it is not the less true that a great part of our population is tainted, and deserves to be branded with reproach.

The native fruit of a thinly populated country, growing without culture, and free for all—has doubtless had its share in producing this laxity of morals. "I would sooner have a hundred Irishmen around me than one Yankee," was the declaration of a sufferer, whose fruit had been plundered near the line of the Erie canal, when that great work was in progress. But Europeans are generally more exemplary on this point than Americans—shame on us! When Professor Stowe was in Prussia, where the roads are lined with fruit trees by order of the government, he observed a wisp of straw, attached to particular trees, to protect the fruit: a sufficient guard; but he suggested to the coachman that in America, it might only prove an invitation to plunder. "Have you no schools?" was the significant reply.

Yes, we have schools; but how many where the child is taught to respect his neighbor's property? Too often he acquires literature and vice at the same time. The State of New-York is famous for her schools and her prisons; the latter to supply the defects of the former system, which they do, however, very imperfectly. Better let the mandate go forth that the *morality of the Bible* shall be *one* of the chief objects of instruction. *Teach her children to be honest*, and then with science and literature, a foundation for true greatness and prosperity would be laid.

One thing is worth bearing in mind by those who purchase fruit trees: the *best kinds* are generally as *hardy as the worst*, and the difference in price fades into nothing when compared with the difference in *quality*. Nobody is satisfied with mean fruit after tasting better.

For a fruit garden, a western aspect is generally best, because it is the least subject to sudden transitions of temperature. Severe vernal frosts often prove injurious, or otherwise, according to the weather that follows. If the sky be overcast in the morning, and the air continues cold, little or

no damage occurs; but when the sun breaks out warm, the injury is greatest; and the most so, where the trees are most exposed to his rays. For this reason, a hill or a wood on the east side, may prove very beneficial.

A northern aspect would go far towards insuring regular crops of the peach, nectarine, apricot, if protected from the sun and warm winds by a belt of evergreens. On sandy soils especially, the reflected heat is often sufficient, in autumn or winter, to *start* the buds; and snow and ice have been successfully* heaped round the trees to prevent this disaster; but a northern aspect would probably render such labor unnecessary.

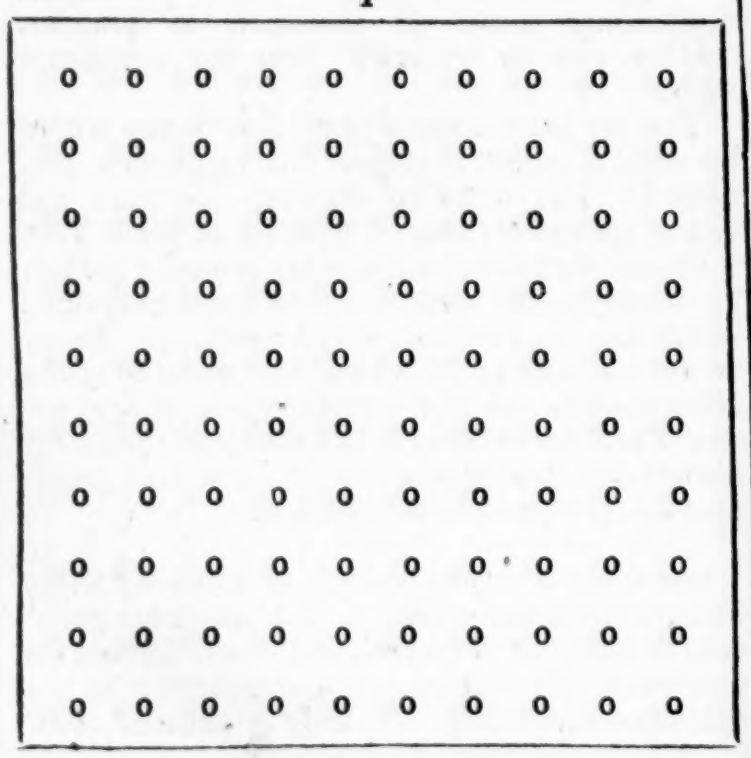
Dry firm ground should be chosen, preferring a sandy or gravelly loam, though clay will do with good culture. Wet, peaty, or spongy soils are apt to be frosty; for the radiation of heat is much greater than from firmer land.

Four *orders* of arranging or planting trees have been employed, which the annexed figures exhibit, all drawn by the same scale; and the distance between the nearest points (or trees) is intended for one rod. One hundred of these are represented in two of the figures; but in the *quincunx*, owing to the vacancies in the sides, only ninety-eight are given, while in fig. 3 there is a surplus, although some vacancies also occur at the sides.

The *first order* requires less calculation, and is more generally in use than any other; but in laying out the ground, the boundaries should be first accurately determined; and the lines may then be drawn across it with precision. No less care and attention in this respect, however, would be required by the other *orders*.

The *quincunx* fig. 2, is only a series of squares laid off diagonally; and we cannot perceive any advantage that it has over the common square, though it was formerly much in fashion.*

1



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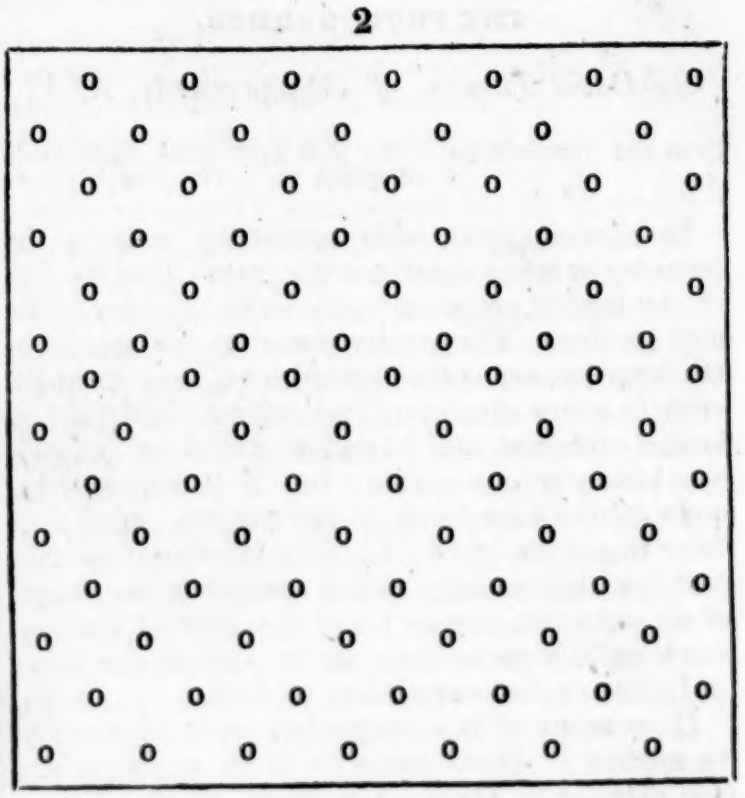

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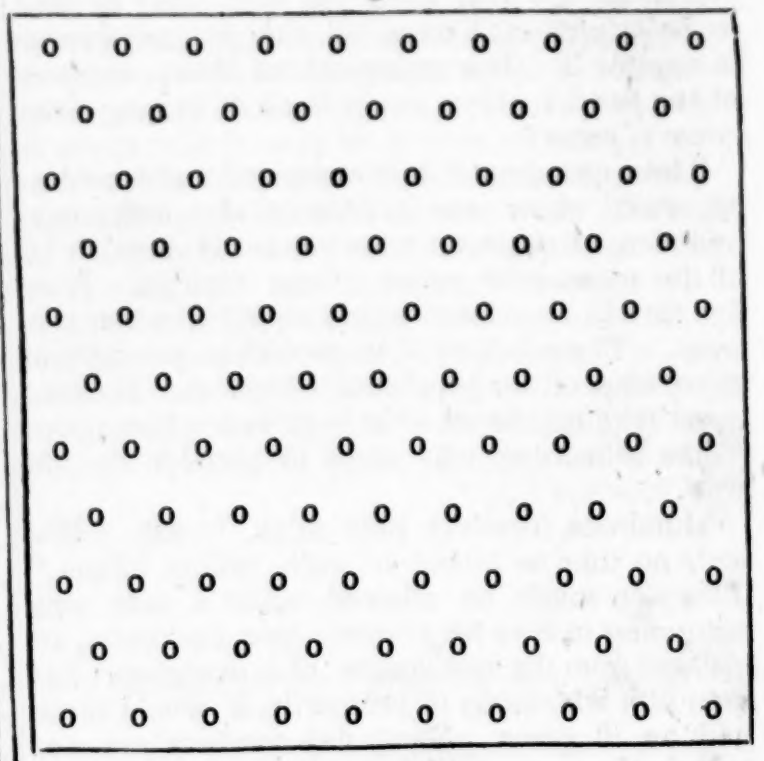
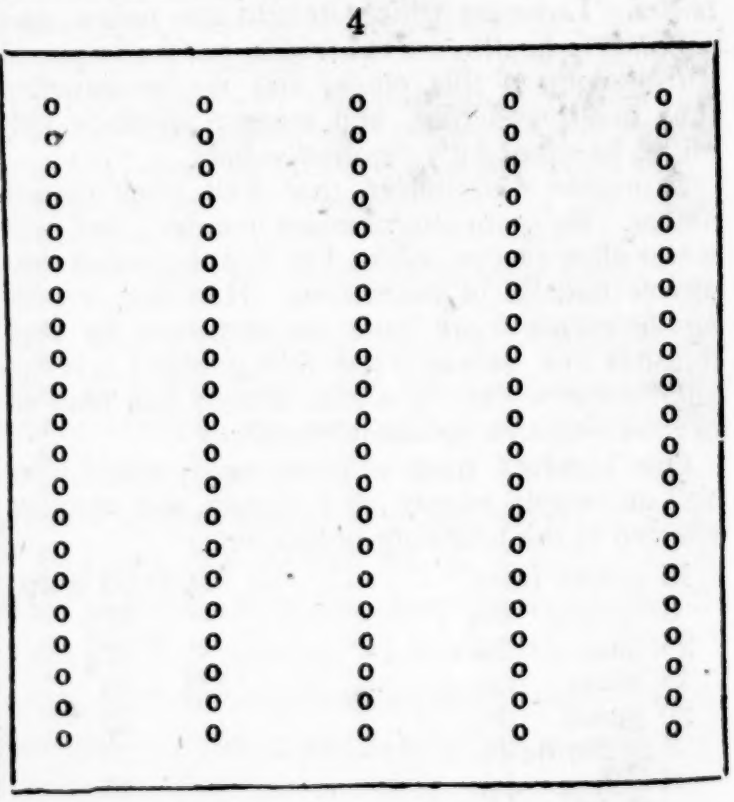


4



* We caused an apple tree to bloom a fortnight later than the rest of the orchard, by piling wood round it.

* Pope said of Lord Peterborough,

"Even he whose lightnings pierced the Iberian lines,
Now forms my QUINCUNX, and now ranks my vines."

In the *third order*, each tree (except at the sides) is surrounded by six others, all at equal

distances—in other words it stands in the centre of a *hexagon* made of six equilateral triangles. The trees are thus more equally distributed over the ground than by any other arrangement; and if cultivated by the plough, the furrows may be drawn in three different directions.

The *fourth order*, as explained by the figure, may be considered as rather a new proposition; but where a team is to cultivate the garden, the plan has some decided advantages. The spaces between the rows, are wide enough for the deepest ploughing, though it should be more shallow near the trees, and in no case come close enough to touch them. A lighter plough with one horse walking in the last furrow, however, may continue the work, and save much manual labor. And where nutriment is so near, the roots will soon find it.

To lay out the garden according to this plan draw the line for the first row, one rod from the fence; then leave a space two rods wide, and draw another line; and so on till the fifth row be completed, which will be one rod from the fence on the opposite side. This distance will allow room enough to plough between the trees and the fence, and for them not to hang over and tempt prowlers to reach the fruit on tiptoe.

Now 10 rods are 165 feet, and 32 substracted leave 133 feet, the distance between the first and last trees in the row. For 20 trees, 19 intervening spaces are wanted; and 19 into 133 give seven feet for each space. The trees though crowded *lengthwise*, will find ample room to spread *laterally;* and our experience is decidedly in favor of this method.

It has been found very useful to keep swine and poultry in the fruit garden, on account of their services in destroying insects, and especially the curculio. In many instances no other protection has been necessary; but where the garden is large, the *plum*, *apricot*, and *nectarine* should be planted in the same *quarter*, so that the hogs, if wanted, may be confined amongst them for a time. *Cherries*, and even *peaches*, would also receive benefit from their presence, though these fruits generally suffer less from this insect than the former sorts. Cherry trees, however, should stand near together, so that from a central seat, a load of shot may protect them. We do not mean that all birds fond of cherries should be destroyed, but only such as take more than a reasonable share, or that render no services in return.

Many people have a prejudice in favor of birds that no well balanced mind should entertain. "Denizens of the air," have no more right to our property than denizens of the earth. Plunderers on two legs are not more respectable than plunderers on four legs; and cedar birds are entitled to no more regard than rats, unless personal beauty can atone for moral deformity.

Ornithologists often become partial to the subjects of their study, and side with them against the farmer and the gardener—magnifying their services and overlooking their trespasses. The laborer, indeed, may drive the geese from his cabbages, throw stones at the crows, and even shoot a hawk—but not the birds that devour his cherries?

An amiable writer, in reference to such visiters, says, "Such has been the security they have felt in our grounds, and so great their increase, that not only *cherries*, *gooseberries*, and *currants*, but *apples*, *pears*, and *plums*, have been ravaged; and it may become a matter for serious consideration whether in continuing our protection, we do not risk the *total loss* of some of the most desirable appendages to the dessert." Now if called into council, our advice would be prompt and brief: Treat them according to their doings. Make pies of the robins, orioles, and cedar birds—one chicken is worth a dozen of them for business; but save and protect the blue birds, warblers, and sparrows—these are always our friends.

Stunted trees always produce smaller fruit than when the same kind grows on vigorous branches; but the fruit suffers in *flavor* as well as in *size*. The trees should therefore be planted in deep beds of fertile soil. In dry seasons, more especially, this provision is of great importance; and young trees treated in this manner are not only more likely to live, but grow much faster, bear much sooner, and bear much better fruit than on sterile land. All our observations go to justify these remarks.

When young trees are taken from the nursery, inquiry is often made how soon they will come into bearing? It is a very proper question, and it would be a proper answer to say: Very much according to the treatment they shall get. When they are set in holes cut out of a sod, just large enough to receive the roots with some crowding, and are then left to take care of themselves, we have no right to expect them to come soon into bearing nor to bear much when they do. Neither half starved cows, nor half starved trees will be found profitable. In the latter case especially, the interest on the purchase money is generally lost for some years, and not unfrequently the purchase too; but we hardly ever lose a tree in good condition, set in mellow ground which is kept mellow.

The holes for the trees should be not less than four feet diameter and fifteen inches deep, but a greater breadth and depth is desirable. Place the soil round the brink of the hole, ready for filling in again; but scatter the harder subsoil back out of the way. The hole should then be filled with the best earth, and rise a few inches above the general surface on account of its settling, first mixing three or four shovelfuls of chip-dirt with the part that is to come in immediate contact with the roots. It helps to keep the ground loose and moist, besides yielding much nutriment to the trees.

The roots of the trees when taken from the nursery should be carefully guarded against *drying* or *freezing*. If such care, however, has not been taken, bury the *frozen* roots in the *ground* before they can thaw, and plunge the *dried* roots with several feet of the main stem into *water*, to soak there from 12 to 24 hours, till the moisture is sufficiently restored.

In planting, spread out the roots carefully, and let the best point against the strongest winds. Fine or mellow earth should fill up all the spaces between the roots, so that every fibre shall come in contact with it on every side; and in order to accomplish this intention more perfectly, throw in a pailful of water when the roots are covered, to wash the earth down, and to fill up every interstice.*

* An experienced horticulturist says, nine-tenths

Newly planted trees being acted on as levers by the wind, often press the earth round their stems aside, and make an opening down to their roots, which in consequence suffer from both drought and disturbance. To prevent this disaster, it is therefore important that stakes should be provided to support and stiffen them. If driven before the trees are planted, they may be erect; if driven afterwards, they may be slanting; and in both cases, straw bands should be first wrapped once round to prevent the trees from chafing.

When trees are set in clay which holds water like a tub, they *soak* and often perish; especially if transplanted in autumn. This evil may be readily prevented, however, when the plough can be introduced, by drawing several very deep furrows where the trees are to stand, clearing out the loose earth with the shovel, and then employing chips, brush, potato tops, straw cornstalks, or old rails, in constructing an under drain. Even if made with these materials, it would last for an age, for when mouldered into earth, the water would soak away along the seam.

Early in summer, after the trees are planted, let the ground be well dug round with the spade, commencing shallow near the trees, but deepening as soon as there is no danger of disturbing the roots. One spading is worth several hoeings, though the broad hoe may be profitably employed once a month after the spade has thoroughly loosened the soil. Trees managed in this way, will grow much faster than if the ground were just scratched over to the depth of an inch or so; and many of ours have grown as luxuriantly through the late excessive drought, as if they were in want of nothing.

The pruning of young trees to prevent their *splitting down*, is a very important operation. Many are greatly injured, and sometimes ruined, for want of this precaution. Where the limbs diverge considerably, nature has provided a kind of net-work of the firmest wood to connect them together; but where two leading branches take nearly the same direction, they soon begin to press against each other; and the bark interposing, the wood is prevented from uniting. The consequence generally is, that when loaded with fruit, they are broken down by the wind. Now it is far better to cut off the limb in time. No material loss is sustained, as all the nutriment flows into the other branches, and increases their vigor.

The advantage of pruning apple trees, is generally known; and unless many of the limbs are cut out, some of the finest varieties become comparatively diminutive and insipid. The same care, however, is rarely extended to other fruit trees. When the twigs become stunted and mossy, sometimes they are trimmed by the tempest, or broken down by an untimately fall of snow; and then the benefits of pruning are manifest, even when done in that rough style. It is better, however, to depend on art than accident. As a general rule the best flavored fruit of the kind grows on the most vigorous branches well exposed to the sun and air; and with this idea constantly before us, we shall hardly do amiss when we apply the axe, the saw, or the chisel; though we may specify that cross branches should be lopped, and thrifty shoots that have room to spread, should be saved.

The tree mosses are parasitic plants, and should be expelled from the fruit garden. Lye is often used for this purpose on the apple tree; but we think it is no better than lime whitewash, which purifies the bark, and leaves it in a fine healthy condition. Once a year is quite sufficient.

Under deep snows, or snow drifts that settle round the trees, the *meadow mouse* often gnaws the bark to their great injury or destruction. This animal however always *works under cover;* and therefore the damage may be generally prevented by piling mellow earth round the stems, a foot high, late in autumn. The snow as it falls, is generally swept away from the pile by the wind; and even if the mouse should persist in climbing up on the earth—which we have not known him to do—he would soon come out into the open air, except when the snow was very deep.

Another method which has never failed with us, though requiring attention—is to *tread the snow firmly down round the stems;* and this should be carefully done every time that a deep snow falls, or whenever a drift is forming round the trees. The mouse, as he roots along, always turns away from the hardened snow.

Trees completely *girdled* by the mice, however, may be saved by setting grafts *early* in the spring to restore the communication between the two detached portions of the tree—in other words, by grafting them together. Part of a small branch should be *inlaid*, both above and below; and if skilfully done and carefully coated over with grafting mud or wax, it will be very likely to grow, except on the peach or nectarine. We have succeeded in this way on a pear tree; but three or four should be set round the tree.

Cultivated *cherries* belong to several species, which have spread into many varieties, and probably *hybrids*. The caterpillar sometimes feeds on the leaves; and the curculio punctures some of the fruit which in consequence becomes *wormy;* but no fruit tree yields a more certain crop, bearing every year without intermission, unless the blossoms or young fruit be damaged by frost. Some kinds, however, as the *morello*, have been nearly destroyed in some parts of the country by the "*black gum.*" This excresence is caused by an insect which should be carefully sought for, late in the spring or early in the summer; and as soon as the bunches appear, the limb should be cut off and burnt.

The *slug*, another insect, feeds on the pulpy part of the leaf, despoiling its verdure and wasting the vigor of the tree. It might almost be mistaken for the filth of some little bird. It soon renders itself conspicuous, however, by its works; and though it sometimes attacks the foliage of other trees, the cherry leaf appears to be its favorite food. It may be destroyed by throwing fresh ashes among the branches by means of a shingle—every worm that is covered perishes. It has been done when the dew was on the leaves; but if the slug is moist enough of itself to catch the ashes, it would be better to apply them when the leaves are dry, because the latter would neither be injured by the potash, nor defiled by the dust.

The cherry tree is more impatient of *nuisances*

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of the deaths from transplanting arise from the hollows left among the roots of trees by a careless and rapid mode of shovelling the earth in about the roots.

than most other kinds. Some have been destroyed by ashes thrown round the stem. Under two trees, the pigs were fed with corn, and the cobs scattered over the ground: both perished. In a slight depression near another, the water collected in rainy weather, and the geese dabbled in it: the tree died the same summer. Lime whitewash has also been charged with injuring the cherry tree; and if it be used at all, the experiment should be cautiously conducted.

The *morello* and *Kentish* appear to be adapted to a greater variety of soils than the *heart* cherry trees; and may be employed as stocks for the latter in unfavorable situations. The outgrowing of the stock by the graft, constitutes no valid objection. We have never seen a tree endangered by such overgrowth, while the obstruction to the descent of the juices, favors the enlargement of the fruit.

The *apricot* was formerly ranked with the plum, but it differs enough to stand separate. Like the plum however, it has a smooth stone, and turns sour with heat; though in flavor it resembles the peach more than any of our fruits. It resembles it also in the excitability of the fruit buds in winter. Its earlier bloom exposes it rather more to severe weather in the spring, but generally it succeeds wherever the peach can be successfully cultivated. In this climate, the tree is perfectly hardy.

There are two species of the apricot: the black, and the common sort, which has spread into many varieties. Ripening earlier than the peach, their presence in the fruit garden is very desirable.

Neither the borer nor the caterpillar attack the *pear* tree; but sometimes flies, wasps, and hornets are busy among the leaves, showing that all is not right, and that honey dew emitted by plant lice, attracts them. But this tree is subject to a more serious injury, to wit: the *fire blight*, which occurs early in summer, the leaves from the extremity of the branches for two or more feet, appearing as if they were *scorched*. We think however, that two distinct causes occasionally operate to produce similar effects, namely: insects, and a starting of the bark in winter.

The late Professor Peck on examining the branch of a pear tree which had died with fire blight, said the damage was caused by an insect (*Scolytus pyri*,) and that to cut off the limbs a foot or more below the dead part, and *immediately burn them*, would be the proper remedy. We have faithfully followed this advice; and though the fire blight has been several times in the fruit garden, its ravages have always been arrested at once, so that we have not lost a tree from this cause in twenty years. We have believed that the new colonies went with us when we carried off and destroyed the branches.

The starting of the bark in winter, appears to be caused by an untimely flowing of the sap, followed by intense cold, which expands it into ice, and separates the bark from the wood. We have observed such effects once or twice, succeeded on some of the smaller branches by a blighting of the leaves, but we believe it seldom occurs in this district.

The *plum* tree is sometimes, though rarely, attacked by the *peach worm* in western New York. Its most formidable enemy, however, is the insect that causes the "*black gum*," similar in its effects to the insect that destroys the morello, if they are not identical. Be this as it may, it is rapidly increasing; and unless our farmers shall turn over a new leaf, the plum will soon become very rare amongst us. In every direction that we travel, branches are loaded with these excrescences; and if there is one man within fifty miles of us who has done his duty, we should be pleased to hear it.

To guard against this insect, the trees should be well pruned, though not enough to check their vigor, so that the *bunches* may be readily discovered. Unless this precaution be taken, it would be very difficult to find all of them, without spending more time than people in general have to spare. Let there be no delay in cutting off and burning them when they are found.

It appears that the eggs of this insect are deposited in a slit of the bark some time during the summer, and where they generally pass the winter without hatching. Soon after vegetation commences in the spring, a kind of fungous wood is formed, swelling out on one side of the branch, and amongst this the young progeny finds nourishment and shelter. This fungous wood, however, appears not to be occasioned by the worm, for it often occurs where there are none, but by some irritating secretion from the parent.

After the late severe drought, when the trees took a second growth, we found several *new* excrescences so late in the season that probably the worms would have perished with cold if we had not arrested their career. Does the starting of the fungous wood cause the eggs to hatch?

We have spoken of insects that depredate on the *tree*: we now turn to such as injure the *fruit* by puncturing, and then depositing a nit, so that it becomes *wormy*, and drops prematurely from the tree.

Every person that cultivates the plum, apricot, or nectarine, ought to be acquainted with the *curculio*, both by sight and by character. There ought to be a good drawing of this insect, but we have seen none; and at this season of the year we cannot have one prepared. It is however a dark brown bug, about a quarter of an inch long, and of singular form, having a slender neck and head. When it drops from the tree, it lies still, pretending to be dead; or if a dried blossom or leaf be near, where it can hide, it moves cautiously under, fearing to be seen in motion. When crushed between the thumb and finger, it feels like Indian meal, and like no other insect that we have examined.

It is timid; and when hogs, sheep, or cattle pass frequently under the trees, it is scarcer than in more retired places. Trees that stand near a door where there is much passing are often entirely exempt from its visits; and the same result occurs where they stand in a lane or barn-yard. The late Thomas Forrest, of Germantown, near Philadelphia, tied one end of a cord to a plum tree, and the other end to his pump handle, so that it shook the tree whenever they drew water. It saved the fruit.

This insect on one point is very sagacious. It is unwilling to have its progeny drop on a pavement, or into water. The same shrewd horticul-

turist set his nectarine trees leaning over the fish pond, and not a curculio disturbed them. In regard to pavements, we have had several accounts of their efficacy. A friend of ours had his plums to ripen perfectly over a pavement, while others, without this protection, though otherwise favorably situated, were entirely destroyed.

Only a few trees, however, can be guarded in this way. For the fruit garden, we want something more comprehensive, and have already referred to the services of swine and poultry. They devour much of the *wormy* fruit, and the young curculios along with it; but some of these insects probably escape, besides all such as leave the fruit before it falls.* How long they live is not known; but if we may judge from their difference in size, it may be many years; and to this company the new brood is annually added. Unless the swine and poultry, therefore, can induce them to migrate, the fruit must suffer greatly from their ravages, and such has been our experience.

Finding many of our trees nearly unproductive, we determined in the early part of last summer to call these depredators to account. Accordingly we followed the same plan that we recommended some years ago in the New York Farmer:—spread sheets under the trees, and jarred the branches violently. The little marauders, taken by surprise, fell down by dozens; and the contrast of colors, enabled us to detect them at a glance. We chose the cool of the morning for this purpose, when they were slightly benumbed; and persevered till we had destroyed nearly 1700. In consequence, all the trees that we visited bore fruit in abundance; and to prove that our labor was rewarded, a tree that was overlooked bore three apricots, while another of less size bore a half a bushel.

During its migrations, the curculio doubtless uses its wings; and near its native spot it may occasionally fly into the tree; but from several circumstances, we conclude that it generally ascends by crawling. With this belief, circular tin troughs have been fastened round the trees; and being filled, and kept filled with water, have been found useful—for this insect is no navigator. These appendages however, should be applied very early in the spring, before it gets up the trees. Afterwards they are not likely to be of any benefit whatever.

When the earlier accounts of the curculio were published, it was believed to be identical with the worms that infest the apple, pear, and quince; but Noyes Darling of New Haven, more than ten years ago, discovered that they were very distinct; and we repeated his experiment with the same result. It is a dark gray miller that attacks the apple and the pear, and probably the quince. It was also thought that the curculio continued its ravages until autumn; but the same sagacious horticulturist found that its work was finished before midsummer.

The mark which it leaves on the fruit that it punctures, is in form of a crescent; and we have never seen that mark except on stone fruit.

The *down* of the *peach*, generally protects it against the curculio; but the *nectarine*, which is only a smooth skin variety of peculiar flavor, often suffers even more than the plum or the apricot.

The *peach worm* (*Ægeria exitiosa*) attacks the tree at the root, where the bark is soft from the moisture of the ground, or the shading of grass; but it avoids the hard scaly part, so that old trees are often undisturbed for years. On the reverse, young trees are much injured by it, and sometimes destroyed, especially where two or more are at work at the same time. If they encircle the tree, there is no hope of its recovery, but this is rarely accomplished by one worm.

Though it feeds on the pulpy part of the bark, it seems careful not to disturb the cuticle, so that were it not for the gum and filth mixed together on the outside, it would be difficult to find the depredator. The fresh filth, however, sufficiently indicates its presence. By entering a knife at that point, and slitting the cuticle longitudinally, the establishment is soon broken up, for it is seldom four inches in length; and then we discover a white grub three quarters of an inch long, which is readily extracted. When it is removed, the tree speedily recovers.

Some persons remove the soil to the depth of two or three inches, and apply hot water, hot soap suds, or warm brine, at any time in autumn or spring when the ground is unfrozen; and if the gum be also removed, so that the fluid can enter the hole, the worm is sure to perish.

Various methods have been employed to *prevent* the attacks of this insect. In the spring, earth has been piled round the tree a foot high, covering up all the bark that was tender. With the same object in view, canvass or ropes made of hay or straw, have been wound about the stem, and then coated with whitewash. Straw in an upright position has also been applied. Tan in small boxes has answered the same purpose; and its properties are also repulsive. Lime and ashes have the same effect. Common salt, either alone or mixed with nitre, has been found efficacious, besides promoting the growth and productiveness of the tree. Half a pound has been scattered round it at a time. Soot, employed in the same way, is highly recommended. A small red cedar, planted in the same hole with a peach tree, has protected it by its offensive odor. Charcoal in small pieces, heaped up, is supposed to smother the worm by choke damp, and sulphur to poison it with its fumes. Doubtless all are useful, but the appendages should be removed when the warm season is over.

Sometimes a worse evil than the worm, however, overtakes the peach tree. This malady was named, by the late Judge Peters of Pennsylvania, "*the yellows*;" but the leaves are not always yellow, as the name would imply. A more certain indication is the premature ripening of the fruit, with purple discolorations of the pulp, and deficient flavor. As the disease advances bundles of slender twigs protrude from the larger branches, and increase till the vital energy is exhausted.

This case is perhaps the only instance of a contagious disease among vegetables, communicated by contact of the roots, or the application of pollen. That such are the facts, indeed, has not been directly proved, but the circumstantial evidence is strong and pointed. Young, healthy

* Last summer, we observed several cases of this kind where the larvæ had escaped through small holes in the sides of plums and apricots.

trees, speedily decline when planted among diseased roots. Frequently, the first appearance of the premature ripening is confined to a solitary branch, when no trace of the disease can be found in any other part of the tree. When this happens, it is prudent to amputate immediately, although it is doubtful if the tree itself can be safely left to stand till it blooms again. In particular cases we have pruned closely, destroying the blossom buds, and giving it a chance for recovery, without endangering other trees; but we would not recommend it as a general rule, but extirpate the tree in due time.

It is certainly known, however, that the disease can be communicated like the smallpox. We have set buds from sickly trees into healthy stocks, and all have perished in the course of the year. Yet different degrees of virulence, perhaps depending on the stage of the disease, are observable.

There can be no doubt that on a sickly tree, the pit or kernel is as much affected as the pulp that surrounds it; and therefore such stones ought never to be planted in a nursery. A peach tree not attacked by worms, and free from this malady, ought to live at least 50 or 100 years; and we believe no reason whatever, except the two just mentioned, can be assigned for their early decay. If the worm is not at the root therefore, when the tree is sickly, we may conclude it has the yellows; and that this disease, if the pit was tainted, has

"Grown with its growth and strengthened with its strength."

Some varieties of the peach and nectarine, are subject to a *white mildew*, which appears on the new shoots about midsummer, checking their growth, but not attended with any other ill effects. It seems analogous to the mildew on the grape and gooseberry; and may be cured (it is said) by the application of sulphur water. A better course, however, for culturists in general, would be to stimulate the tree to make a handsome growth in the early part of the season, and to take no further care.

This disease appears to be exclusively confined to Lindley's *first class* of peaches and nectarines, "whose leaves are deeply and doubly serrated, having no glands." Some varieties of this class, however, suffer very little; while others, such as the early Anne, are much impeded in their growth.

The peach is justly considered the most delicious fruit of the temperate zone; and yet it is scarcely known in a large portion of the state of New-York, which we have much reason to believe would admit of its successful culture. Not only in the high lands between the Cayuga lake and the Susquehanna, but also in the elevated region between the Great Bend and the Blue Mountain in Pennsylvania, this tree has been found healthy and fruitful. We saw several in fine order, the very next season after some had perished with the cold in the low and beautiful valley of Stroudsburgh.

To some persons this statement may appear like a paradox. But what are the other facts in this case? Warmth in winter is pernicious. It starts the sap, swells the bud, and the intense cold that follows destroys bud and branch. On the contrary, the steady cold of the hills is conservative. The bud is so exquisitely folded and prepared for a severe season, that unless it is disturbed by the sap, it is safe from the greatest cold of our latitude. Like the seeds of the melon, or a grain of corn, it appears to be too dry to freeze.

In the middle districts of our state, let horticulturists therefore remember that the hills are more favorable to the peach than the valleys; and if their labors are unrewarded in the low precincts of their villages, let them occupy the neighboring heights, and lay out fruit gardens there. Let them also remember that many trees and shrubs which are hardy in a dry rocky soil, perish with the cold in a rich border. In the latter case, the wood is not sufficiently matured, and the frost strikes it when it is full of sap, like a weed. To crop the ends of the peach shoots, when they grow too late, has been useful—not so soon in the season as to start the buds, but as soon as that danger is over. We have alluded to the loss of the fruit buds in winter, and the early bloom of this tree. These two causes render the peach a more uncertain crop than the plum or the cherry; but particular circumstances, perhaps not well understood, have had an influence on its productiveness. Where trees stand in the same immediate neighborhood, some are barren while others bear; and a belief is becoming prevalent that grassy ground is most favorable. Though we are not entirely prepared to decide on this point, yet most of our observations lean in that direction; and if it be proved, an exception to our plan of managing the fruit garden ought to be made on behalf of the peach, nectarine and apricot, as soon as those trees are of full bearing size.

Some years ago, we drained a shallow swamp; and though the situation is high and airy, peach trees of the *best bearing kinds* planted there have always been unproductive. Now the annual cultivation of the soil, doubtless, rendered it *more spongy*,* and consequently *more frosty*, because it radiated more heat than the paler and firmer ground. But was this the *only* cause? and if so, did it cause the destruction of the buds in winter, or in the spring?

One fact, however, should not be forgotten; To accelerate the growth of the peach tree when bearing, by either culture or pruning, endangers the fruit. In summer, therefore, the soil should not be disturbed.

The *quince* tree as well as the apple tree is subject to the attacks of the *borer*. The larva of this insect, resembles the peach worm; but it cuts through the solid wood, and therefore is much more difficult to extract. With a barbed wire, we have often succeeded, and sometimes failed. In a young tree that had been neglected, we found them so deeply entrenched, and their holes so winding, that they kept possession. We then made a small auger hole through the heart of the tree, and filled it with sulphur. A few days after we found one of them in a dying state, and no more filth was ejected. Quince trees should be examined on this account at least once a year.

As the pear tree is not infested by the borer, it has been employed as a stock for the quince tree,

* Would the increased radiation from this cause be counteracted by spreading straw chaff or shavings under the trees?

and if budded or grafted a foot or more from the ground, it must generally be safe from such attacks.

The quince tree like the pear tree, however, is subject to *fire blight*; but only a few inches of the ends of the branches suffer. Whether this appearance is owing to the more stunted nature of the tree, or to a different insect, is not positively known; but as it is probably caused by an insect, it would be prudent to cut off the dying tops, and burn them.

Though *winter pears* have something like a determinate time for ripening or becoming soft, yet this period may be accelerated or retarded, by increasing or diminishing the temperature of the place where they are kept. Our experiments on this point within the last year, have been very conclusive. Pears of a sort that had continued hard until spring in a cool cellar, have ripened towards the close of autumn, in a warm room; and by placing them in different temperatures, the season for each particular kind may be greatly extended.

When *winter fruit* is buried in the ground for long keeping, it should be placed in a box, or on a bed of straw, and be well covered with the same, so as not to come in contact with the damp earth which causes it to swell, crack, and lose its flavor; and to prevent it from becoming musty, it should be kept in an out-house, till the ground begins to freeze. We have never known fruit to be damaged that was treated in this manner, and then timely removed in the spring.

Greatfield, 12*mo.* 17, 1841.

REMARKS ON DRAINING, AND PARTICULARLY SMITH'S DEANSTON SYSTEM.

Extract from the London Farmer's Magazine.

The present practice of subsoiling is an excellent one, when the land is sufficiently drained; but I am afraid it will only be a fashion of the day, because it is not new. In an old work on agriculture, there is a plate of a subsoil plough, exactly similar to Mr. Smith's plough, and was used for the same purpose. The only difference was in name, as it was called a "resurrection plough." Before this plough be put to work, the drainer must finish his; and I will now say a little on this subject.

The newest fashion in draining is called the "Deanston thorough and frequent system." To hear some talkers and writers on this subject, particularly those who talk and write by a snug fireside, with a bottle of wine before them, one would suppose draining was unknown in Britain before Mr. Smith commenced upon his farm. I have read his work on the subject, and have heard some of his speeches, and I consider him to be a very sensible man, and a good practical farmer; but, notwithstanding, I am going to find a little fault with his draining. I have been a drainer myself more than thirty years, and upon the frequent system too. It is the fault with nearly all drainers, whether with the pen or in the field, that they have each one particular system of their own, and that they consider this the only proper one for every part of the world. Had I never drained any but my own native farm, I should most likely have erred the same way. In my practice I have drained land which had, at some former period, been drained exactly upon Mr. Smith's principles; of course the present fashion is only an old one revived. Some time ago "Elkington's system" was the leading *ton* in draining. His system was quite opposite to Smith's. He would drain a whole farm, or district, with a single drain. His system was adopted in this neighborhood; and the only effect it had was drying up some of the draw wells, which had to be sunk deeper to get the water again. With the surface of the land, it made not the slightest difference, yet I have seen cases where it has drained the surface.

Now, from my own experience, I have learned that no one system will produce the best effect on every description of land at the same cost; and this is what should be the aim with all drainers. I say, let me see the land, and not only examine its surface, but the subsoil, and, in some cases, the adjoining lands also, before I conclude on the direction, the depth, or the distance of the drains. I am quite of Mr. Smith's opinion, that a great breadth of land requires draining, which is considered by most farmers to be sufficiently dry. He recommends that in every case the direction of the drains should be right up the incline of the land. There are cases when I should do the same, because I know there are cases when it will, and has answered; but generally I should not do so, because I have frequently seen it practised where it has not answered or produced a proper effect. His arguments for taking the drains up the incline of the land are—1st, "Because the strata is cut longitudinally, and by a drain directed down the steep, the bottom of which cuts the stratum to the same distance from the surface, the water will flow into the drain at the intersecting point of each sheet or layer on a level with the bottom of the drain, leaving one uniform depth of dry soil, because the stratification generally lies in sheets at an angle to the surface." Now, "generally," I have found in this country, that the stratification lies in sheets horizontally to the surface; and whenever this is the case, it is quite clear that a cross drain will drain more land effectually, than one up the incline; and to drain the land effectually, with the fewest drains, is a matter for serious consideration with every farmer.

Mr. Smith's second argument for pointing his drains up hill is, that water can run off quicker; for he says, at page 10, "whereas cross drains having little declivity, are often filled high up with water for years before the mischief is discovered." Now if there be a little declivity, the water will run off. It is where there is no declivity when the water stands high in the drains. This is the fault of the drainer, not of the system. Again he says, "it is quite necessary to fill drains directed down the steep, with stones of small size, or with danders or gravel, to prevent the current of water from cutting or running the bottom of the drains." He first directs his drains down the steep to make the water run off quicker, and then fills them with small stones to make it run off slower. Now, whenever the strata lies horizontally to the surface, I should run my drains across the incline, but with such a fall into

the main drains that the water would neither stand in the drains, nor run off so quick as to injure the bottom of the drain. In four cases out of five, the cross system is the best, and as land is generally ploughed up and down hill, every drain runs across the furrows, which always answers a better purpose than in the furrows. In short, I should never have high crowned ridges where the land was properly drained.

Now, sir, for broken stones instead of hollow drains. I have seen drains taken up which had been filled thus, perhaps one hundred years ago, and were running tolerably well; I have seen others taken up, which, from the state of the land, had perhaps been run up one hundred years ago. I should, therefore, say that in some kinds of land, or in some situations they may and do answer; but in every situation I should save the trouble of breaking them for strong or clay land; and when I could get stone suitable, I prefer flat stones set on edge to the firm land, and one edge of the corners set to the opposite side and reared to the other, in an inclined position, and forming a triangular drain. At top of the corner, I should put hedge dressing, stubble, croppings of trees, or under wood or gravel, small stones or cinders, between and the surface soil. I should not put any clay in again. If the stones were rough I should adopt the same plan, but cut the drains a little wider. If I used tile I should prefer them made flat instead of arched, and form triangular drains in the same way as with flat stones. In a great number of our coal districts in this county, a broken stone drain would not remain open two years. There is a mineral substance in the soil, (oxide of iron, I believe,) with which the water is so impregnated as to choke the drains, if made of broken stones.

Mr. Smith says, that by the up-hill system, or his system, or what I call the old system raised from the dead, a less length of drains is required to drain an acre of land effectually, than by the cross system; and of course, if sunk no deeper, must cost less per acre. I think I can prove from his table of distances and expense, that as the lawyers say, he has not made out his case.

The distance he recommends for stiff clay subsoils is from 10 to 15 feet; for sandy clay subsoils, from 15 to 20 feet; and so on up to 40 feet, as the bottom is more open and porous.

Now, except Mr. Smith can drain land perfectly dry, with drains at greater distances than these, there can be no benefit whatever in his system; but, on the contrary, a loss. By taking the drains across the incline of the land, four acres out of five, or more, of clay land in this county, would be made perfectly dry with drains, at 15 to 20 feet distance. Very little land would require them so near as 12 feet. But, suppose by taking them across the incline, the land required the drains at the same distance as if directed up the hill, what advantage is there in point of expense? To prove which is the best system on the same land, the drains must be at equal distances in both systems, and in this case the length per acre will be the same in both cases; consequently, the expense would be the same, for both systems require leading drains. One system requires them up-hill, and the other along the bottom of the hill or field.

It does not appear from reading Mr. Smith's work, that he has had any experience in draining on the cross system; of course, what he says against it arises merely from his ideas, or from seeing draining on that system badly executed. Most of the objections he raises against it, may be raised with equal truth against his own. Others are no objections at all, as they arise from the ignorance or carelessness of the drainer, not of the system, and the same ignorance or carelessness, would do the same mischief in any system of draining.

At page 6 and 7, Mr. Smith gives the names of a number of respectable agriculturists, who have "astonished the natives," with the superior crops they have got after draining upon the Deanston system. Now I feel quite convinced that draining was the primary cause of those superior crops; but I will venture to say also, that the benefit arose more from the number of the drains than the direction of them—the "frequent" system, not the Deanston system. I have proved the great benefit of the frequent system 30 years ago; I am acquainted with two farms drained on this system; one of them was drained ten years before I was born, and the other about ten years after. The drainage of these farms is as perfect now as at the first. The inclination of the land on one is very considerable, and in a part of the other.

I am acquainted with a considerable portion of Ayrshire, and I will venture to say that more than three-fourths of it would be drained as effectually at from one-eighth to one-sixth less expense by the cross system, than by the Deanston system.

A gentleman who resides at no great distance from Manchester, drained a quantity of clay land about ten years ago. The drains were put in a right direction for the land, which had not much inclination, but they were laid at too great a distance from each other. They were also very expensive ones, as they cost quite as much as would have made three times the number, which would have been about the proper distance. The manager was a young Scotchman; and, like most of his countrymen who come here young, thought he knew more of agriculture than all the farmers in Lancashire put together; of course, he would not be taught. After a number of years, the proprietor of the land seeing the draining was imperfect, and taking in some *La Belle Assemblée* of agriculture, and seeing there the newest fashion of draining just come down, not from Paris, but from Perthshire, he commenced two years ago, draining the land over again upon the newest fashion; namely, up hill, every furrow, and with broken stone. In March 1840, I was in that neighborhood, and seeing the men at work, I went to see their operations. The ridges were 10 feet wide, of course the drains 10 feet asunder. The men were breaking stones which were beautifully adapted for triangular drains. Now, the subsoil in this field was a very good one for draining, and drains at 21 feet distance would have made excellent work, and would have cost little more than one-third the expense. Some parts of the same estate, to make gook work, would require them at 12 feet distance; but all were served alike. In the above field I showed the workmen that the old drains, across of the incline, drained full 21 feet. I found they were not very anxious to point this out to

their master, and the young Scotch agent had left some years before. Now, there can be no doubt but this land will be perfectly drained; and we shall no doubt see a fine written letter in some fashionable agricultural publication. The letter will describe, in glowing colors, how imperfectly the land had been drained by the cross system with hollow drains, and the most extraordinary effects produced by the "Deanston system;" never taking it into consideration, that it has been the multiplicity of the drains on the latter system which has produced the effect. This letter will be read by amateur farmers, and at some cattle show dinner, some one of these will beg leave of the chairman to propose a toast. This will be prefaced by a flourishing speech on the great national benefit to be derived from the above system of draining, coupled with subsoil ploughing, and which, if generally adopted, will soon be the means of paying off the "national debt," and will end with proposing to drink the health of Mr. Smith, with "all the honors, *three times three, hip, hip, hip, hurrah!* for Smith and the Deanston system of draining." At most of the agricultural dinners I have been at of late years, there has been a great quantity of draining done, both theoretically and practically. The former has been applied to the land, and the latter to the bottle.

A new tenant upon a farm in this township, drained a field of wet clay in February 1840. The field had been oats the preceding year, and the old tenant had allowed the cattle to graze on the field all winter, consequently it was very much poached, and when the draining commenced every hole was full of water. The person who laid out the drains was a little inclined to the "up-hill system" in every case; but knowing I had drained a considerable quantity of land, he asked my advice, which he followed except in a part of the field. In this the drains were taken up the incline. The drains were all laid with tile, and at a distance of 18 feet. When the drains had been open about ten days, I went over the field, and where the drains had been made across the incline, every hole made by the feet of the cattle, and which were full of water ten days before, were now quite dry and the land firm to walk over; while on that part where the drains were made up the incline, the holes still contained water, except those near the drains, thus evidently showing that the cross system was the best by the quickness in which it took the water out of the soil.

Another tenant drained a field in the spring of 1841, which had an incline of about ten degrees; the soil strong, and the subsoil clay and sand, and lay in such a manner as inclined me to think it would drain quite as well, if not better, by the "up-hill system." However, half of the field was drained upon one system, and the other half on the other, by way of experiment. The drains in both cases were made at 20 feet distance, 33 inches deep, laid with tiles, and cinders upon the tiles between them and the surface soil. The field appears to be perfectly drained upon both parts, but next year's crop will afford means of testing the matter more accurately.

Now it appears very clear to me, that the great success of Mr. Smith's system lies in the number of the drains, not in the direction in every case, or in being made of broken stone; for, by the number he puts in, the land would be drained, whatever direction they were put. But I repeat that the object with every drainer should be to give the drains that direction, and that depth, as will drain the land perfectly dry with the fewest drains; and to do this, there can be no rules laid down in books, except general ones.

Draining is of the first importance to agriculture. There is no saying what England may yet do by a general drainage, with a proper use of the plough, the hoe, and the dung cart. I am, sir, yours, very respectfully.

W. ROTHWELL.

Winwick, March 1st, 1842.

CONTENTS OF THE FARMERS' REGISTER, NO. VI. VOL. X.

ORIGINAL COMMUNICATIONS.

	Page
Reports to the State Board of Agriculture:	
1. On the most important recent improvements in agriculture in lower Virginia—and the most important defects yet remaining	257
2. On the Brandon farms	274
3. On part of Nansemond county	298
Report to the Cumberland Agricultural Society on gypsum as manure	270
The times of the ripening of wheat in different places	282
The farm and farming of the Rev. J. H. Turner.—Lime. No. 5.	290
Editorial notes in reply, on liming	293
Remarks on Mr. Turner's opinions of rotations	304
Lime, &c.	304
The wheat crop	304
Remarks on Professor Bronn's theory concerning the influence of the origin of seeds	309
Slugs destroyed by lime	310

SELECTIONS.

	Page
On the comparative merits of the Isabella and Catawba grapes, &c.	266
Liquid manure	266
Destructive insects	267
The sea devil caught at Charleston	268
Need for agricultural experiments, &c.	269
Agricultural condition of Pennsylvania	273
Address before Cayuga Co. Agricultural Society	283
Casks for preserving grain	288
History of the cane	288
A new source of the best manure	305
New artificial manure	305, 306
The influence of the origin of seeds on the quantity and quality of crops	307
Sowing corn for fodder	310
Slugs destroying the cotton crop	310
The fruit garden	311
Remarks on draining, and particularly Smith's Deanston system	318